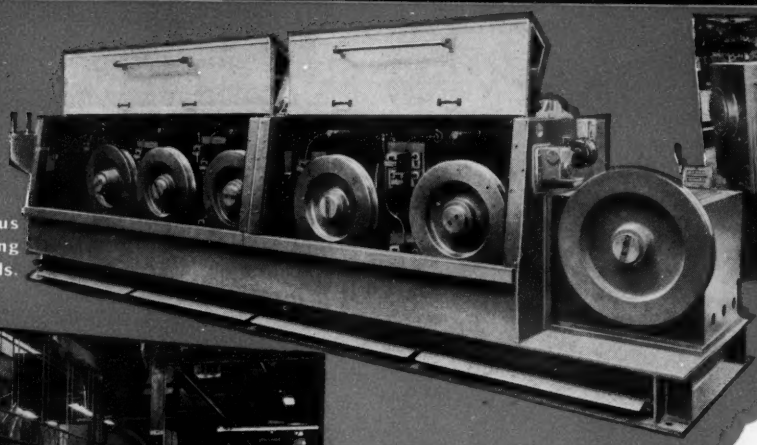
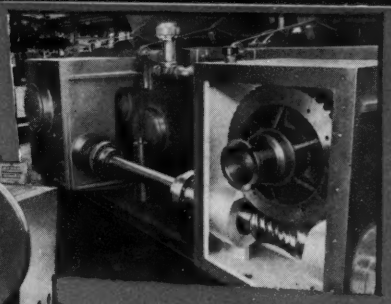
WIRE AND WIRE PRODUCTS

FEBRUARY 1949



Model CT Continuous Tandem Wire Drawing Machine for heavy rods.



Rear view

Installation of a battery of Continuous Fine Wire Drawing Machines.

SYNCRO

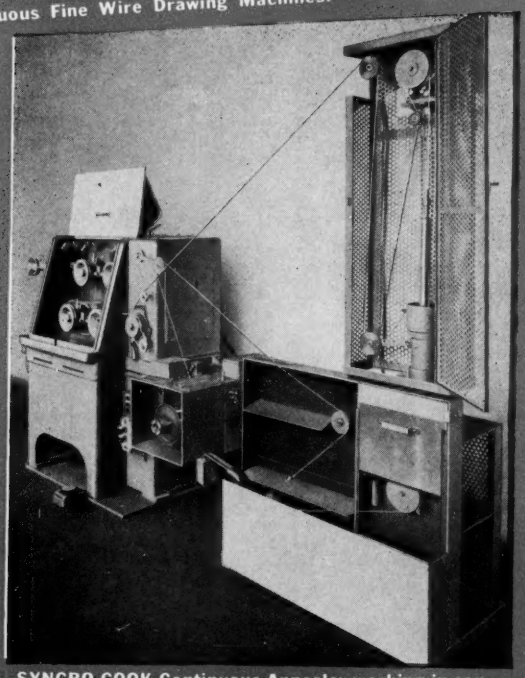
—for better, faster, lower cost ways to produce wires from rod to fine gauge—from strands to cable. Keep in touch with SYNCRO for latest and best methods of wire production.

SYNCRO MACHINE COMPANY

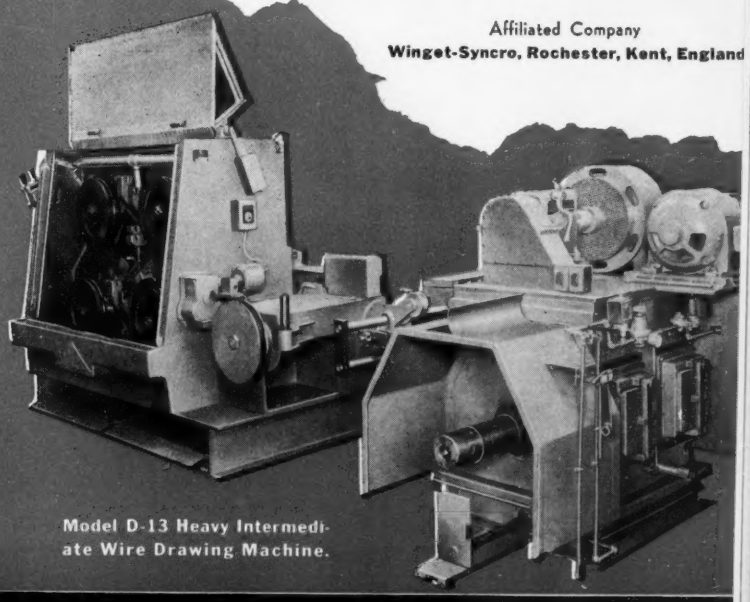
611 Sayre Avenue Perth Amboy, N. J.

Affiliated Company

Winget-Syncro, Rochester, Kent, England



SYNCRO-COOK Continuous Annealer working in conjunction with wire drawing machine and spooler.



Model D-13 Heavy Intermediate Wire Drawing Machine.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

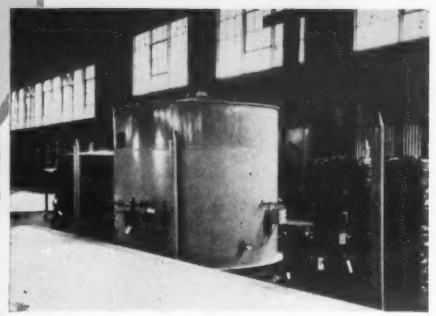
from COAST to COAST

Lee Wilson

WIRE ANNEALING FURNACES

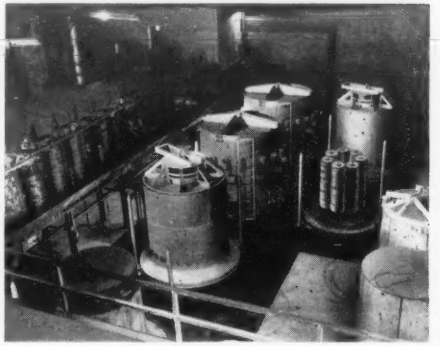
SERVE THE

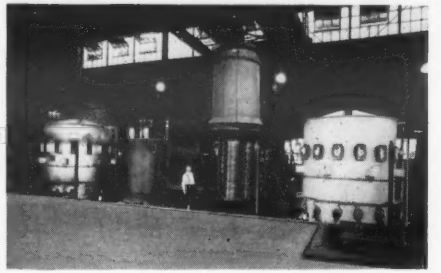
COLORADO FUEL & IRON CORPORATION



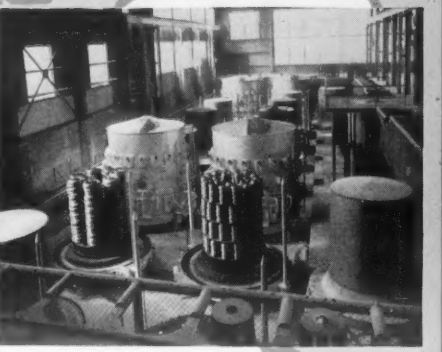
CALIFORNIA WIRE CLOTH CORPORATION
Subsidiary
COLORADO FUEL & IRON CORPORATION

COLORADO FUEL & IRON CORPORATION
PUEBLO, COLO.





WICKWIRE SPENCER STEEL DIVISION
COLORADO FUEL & IRON CORPORATION
BUFFALO, N. Y.



WICKWIRE SPENCER STEEL DIVISION
COLORADO FUEL & IRON CORPORATION
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Telephone ACademy 4670

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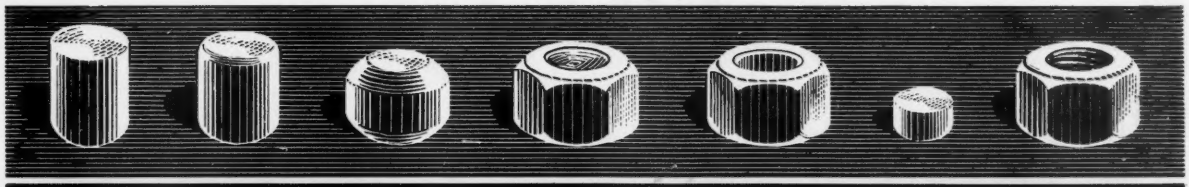


Inviting your inspection

BECAUSE Youngstown "Scrapless" Nut Wire is designed for modern cold-heading operations, it invites your critical tests. You'll find its sizing accurate and its composition correct. It measures up on chemical and metallurgical checks for analysis and microexaminations.

Available in various compositions, including AISI standard as well as special sulphurized steels.

QUALITY V YOUNGSTOWN SERVICE

Youngstown

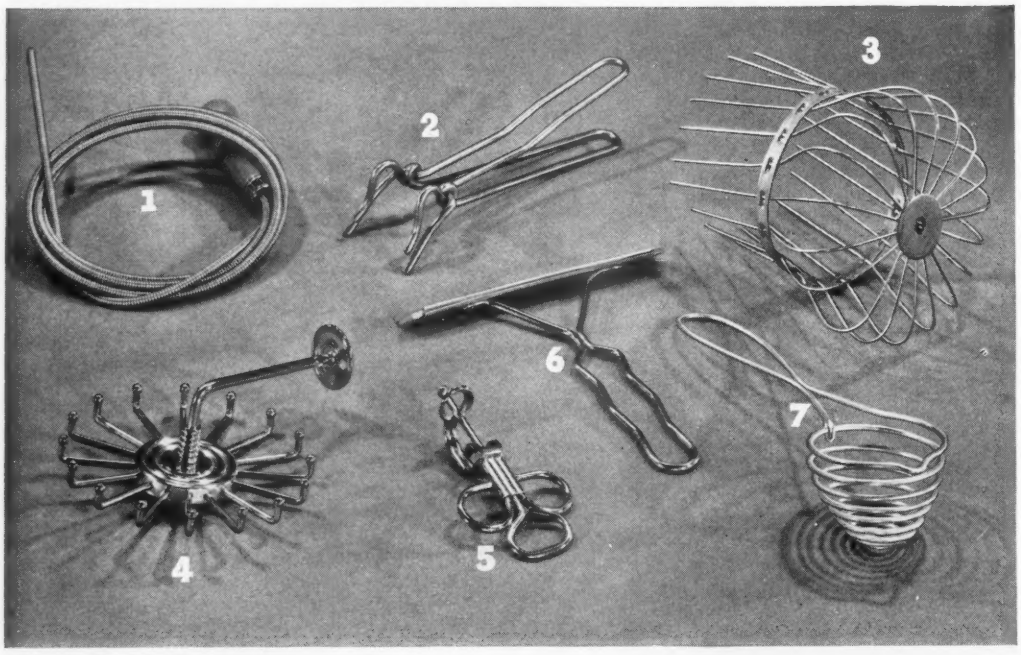
"SCRAPLESS" NUT WIRE

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices — Youngstown 1, Ohio
Export Office - 500 Fifth Avenue, New York

WIRE - COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES.

How many of these wire products can you name

See how many of these gadgets you can match correctly with their names shown at the right. The correct answers, given by number, are shown at the bottom of the page. No peeking!



Cherry Pitter

Hot-Pan Holder

Drain Opener

Cravat Rack

Downspout Strainer

Egg Separator

Squeegee

It may not be easy to identify all these products made from steel wire. But it is easy enough to see why steel is so often the material selected for wire products.

Steel wire is strong, wear-resisting, economical. Whether you want to cold-head it, draw it, or form it, steel wire is easily adapted to fast, modern methods of forming. Nothing else can provide such a wide range of physical and mechanical properties.

Making virtually all kinds of steel wire is one of our specialties. In our modern wire mills at Sparrows Point, Md., and Johnstown, Pa., we produce carbon steel wire in both standard and special grades, and in widely varying compositions and properties.

In fact we've made steel wire for so many different applications that the wire you need is probably a grade and quality we have furnished recently. We're working at capacity to keep up with orders, but that's no reason why you should hesitate to call on us for help in developing your wire products. Perhaps our experience can be of real assistance to you right now.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM WIRE

BETHLEHEM STEEL

1. Drain Opener
2. Hot-Pan Holder
3. Downspout Strainer
4. Cravat Rack
5. Cherry Pitter
6. Squeegee
7. Egg Separator

WIRE & WIRE PRODUCTS, Vol. 24, No. 2, February, 1949. Publication Office, at One Sherman Ave., Jersey City 7, N. J. Executive Office, 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S. $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, January 10, 1949, at the Post Office, Jersey City, N. J., under Act of March 3, 1879.

here's the

NEW PROTECTIVE COATING

for live wires

MARVINOL VR-10, the versatile vinyl resin, offers superior stability in protective coatings from raincoats to jackets and coatings for wire. Here are some of the advantages it offers you . . .

MORE STABILITY . . . In processing and in end products, Marvinol offers you greater stability . . . superior resistance to heat, light, oils, acids, aging, wear and other normally destructive forces . . . better low temperature characteristics. High molecular weight gives Marvinol coats and jackets extra toughness and "dryness."

MORE PROCESSING ADVANTAGES . . . Production runs prove that Marvinol gives shorter premix and Banbury cycles plus faster extrusion rates. These are important savings whether you are calendering, extruding or molding. Wire coatings made from Marvinol may be brilliantly or delicately colored . . . are easily cleaned.

MORE UNIFORMITY . . . Marvinol resins are a development of Martin research and Martin's quarter-century of plastics experience. Produced in the world's most modern chemical plant, they assure unexcelled uniformity. The Glenn L. Martin Company does not compound or fabricate in the plastics field. If you make or coat wire, our sales engineers and customer service laboratory offer full technical cooperation. If you buy or use finished wire, write to Chemicals Division, Dept. W-2, The Glenn L. Martin Company, Baltimore 3, Maryland.

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THE GLENN L. MARTIN COMPANY • AN INTERNATIONAL INSTITUTION
"BETTER PRODUCTS, GREATER PROGRESS, ARE MADE BY MARTIN."

A Famous Trademark...

On A "Work-Horse" Air Cylinder At A "Work-Horse" Price!

DESIGNED by JLE engineers after years of research in pneumatics!
PRODUCED under same rigid supervision that governs all JLE equipment!
TESTED and approved on JLE equipment used throughout the wire industry!

LOW-COST AIR CYLINDER FEATURES

1. Available in standard bore sizes from 1½" to 10" diameter. Can be made in any stroke specified. Has top operating pressure of 110 lbs. per sq. inch.
2. Available in four standard mountings. Standard piston rod attachments available.
3. Can be furnished single or double-acting.
4. Cushioning can be supplied on either one or both ends, if desired.

Ask for complete JLE Air Cylinder details and prices —

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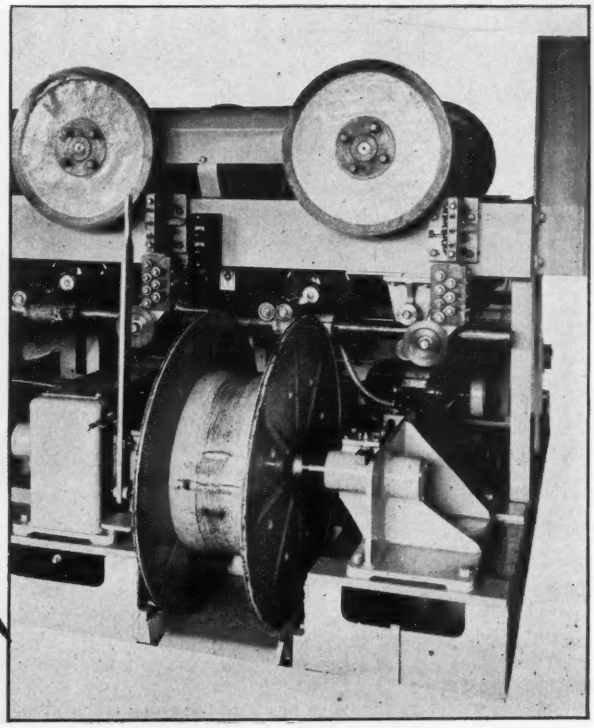
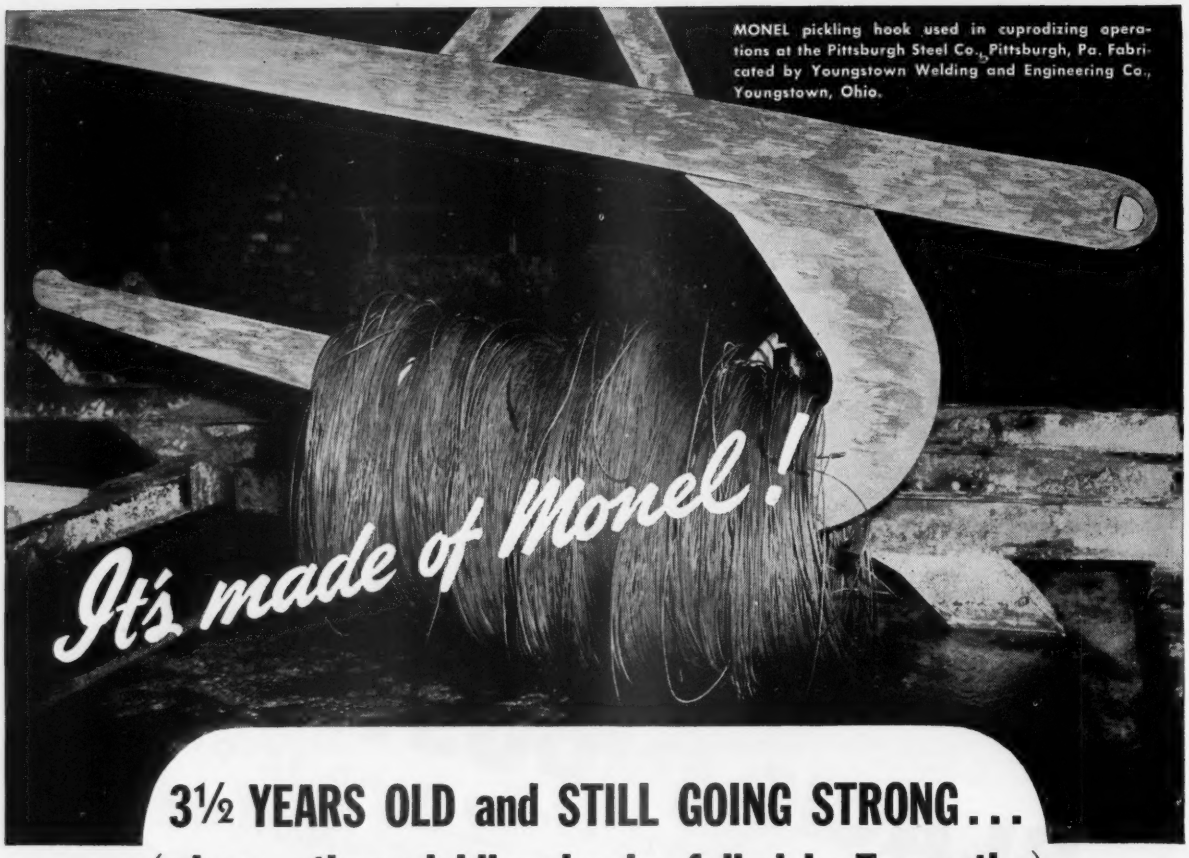
NO RIDERS ON WIRE
SIMPLIFIED CONTROLS
ALL A. C. DRIVE

Designed and built by BLACK





MONEL pickling hook used in cuprodizing operations at the Pittsburgh Steel Co., Pittsburgh, Pa. Fabricated by Youngstown Welding and Engineering Co., Youngstown, Ohio.

3½ YEARS OLD and STILL GOING STRONG...
(where other pickling hooks failed in 7 months)

Several years ago, the Pittsburgh Steel Co. of Pittsburgh, Pa., had a problem . . .

Hooks, used in pickling coiled steel wire, were failing in a comparatively short time. This was adding considerably to the cost of pickling operations, and Pittsburgh plant men decided that the situation had to be remedied.

Several metals were tried, in both cast and fabricated form. But the hooks failed within less than seven months. They couldn't withstand the corrosive action of sulphuric acid pickling solutions and wire-coating chemicals.

Finally, Pittsburgh Steel tried hooks made of MONEL*. . . and found the solution to their problem. *The MONEL hooks have so far outlasted the best of the others by six times, and are still in service after three and a half years.*

Today, at the Pittsburgh Steel plant, a battery of fourteen MONEL hooks carry coiled steel wire through the modern cuprodizing process. And, thanks to MONEL's high strength, each hook lifts a payload of 2,400 pounds.

MONEL equipment can help you increase the efficiency of your own pickling room, too. MONEL crates, racks, chains, hooks, and accessories are used by many of the nation's leading plants . . . to give increased payloads and longer service life.

Our Technical Service Department will gladly help you solve corrosion problems and provide you with a list of fabricators experienced in handling the INCO Nickel alloys. For further information, write for: *"Where Monel Pays Its Way In Pickling."*

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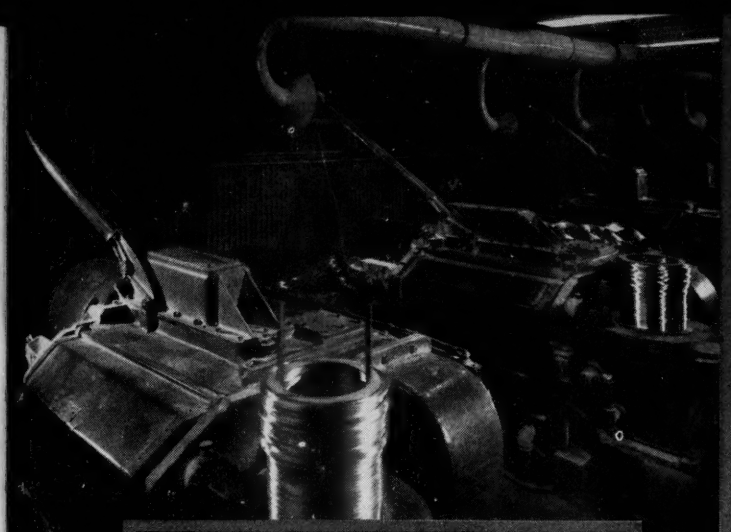

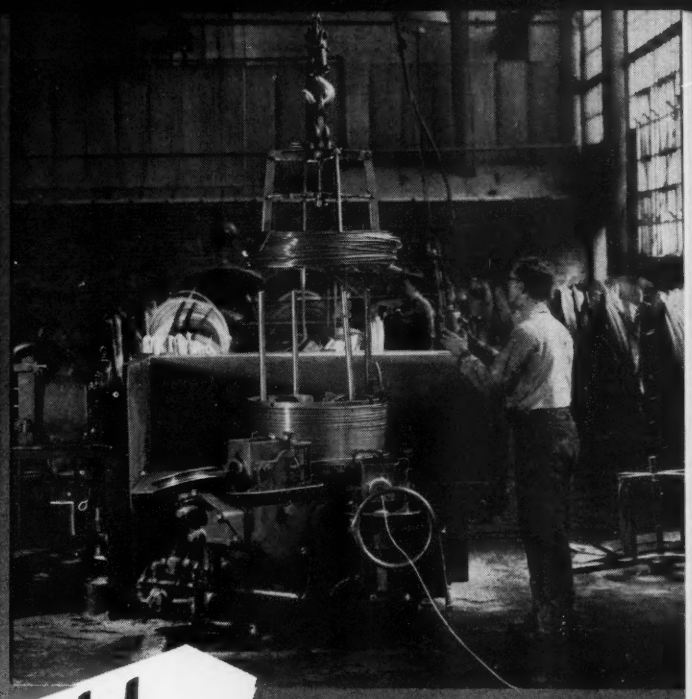

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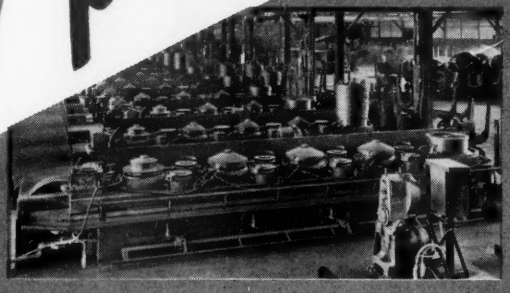
when your

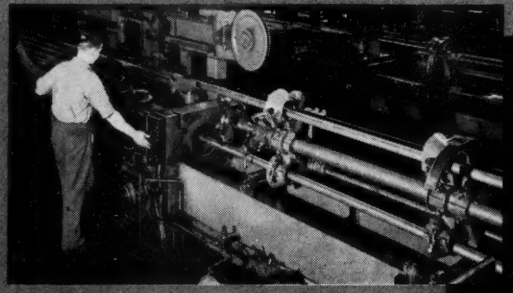
COLD DRAWING PROBLEM

meets

SOLUTION BY VAUGHN!



May we prove how VAUGHN MACHINERY can benefit your individual production—by cutting costs to increase profit? Our wide experience in all phases of cold drawing assures a completely practical approach to your problem. Write!



Vaughn

COLD DRAWING MACHINERY

"Quick on the Draw!"

VAUGHN MACHINERY

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ENAMELED ALLOY	SILK COVERED	LITZENDRAHT AND
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There's more to present day engineering and design problems than shortages of materials, priorities, etc. There is also the question of whether specifications have been rigidly adhered to. Wire, for example, must meet such requirements as specific electrical properties, flexibility, tensile strength, laying speed, uniformity, etc.

Whether it's a buyer's or seller's market, WINCO magnet wire products are drawn to exact specifications. Uniformity of product is guaranteed by mercury process tests and careful supervision guards against variations in consistency, structure or electrical values.

If you have a wire problem, our complete facilities are at your disposal. Send blueprints or specifications for recommendations, without obligation. Samples sent on request; write today.

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HUDSON WIRE COMPANY

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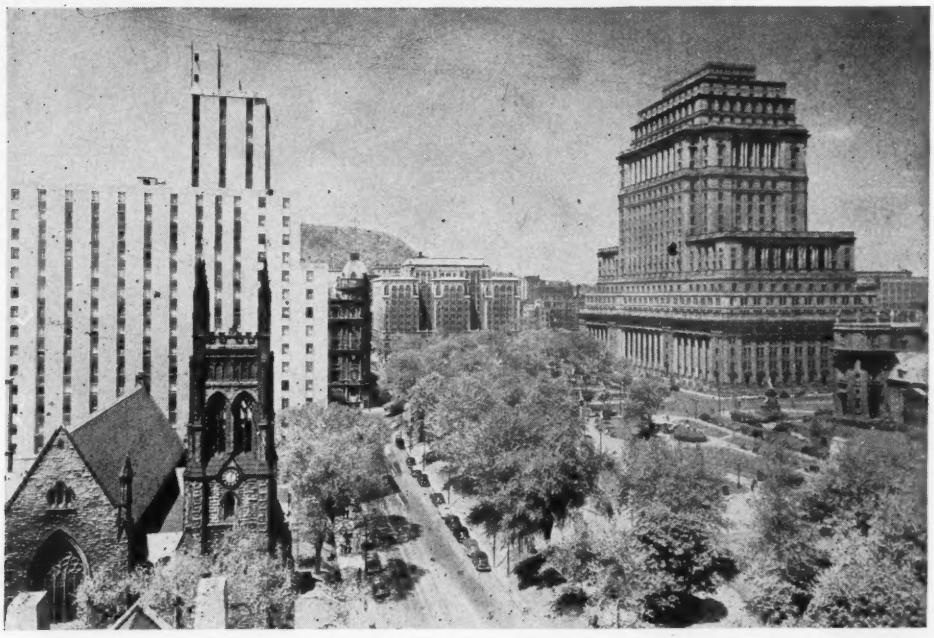
CANADIAN REGIONAL MEETING

— a new and important event in the annals of the WIRE ASSOCIATION'S history.



Dominion Square, Montreal

PROGRAM

April 28th: Registration, 9 to 10 A.M., Mount Royal Hotel, Montreal, Can.
Plant visit to Steel Company of Canada Mill in the morning.
Lunch provided at Northern Electric Company, Lachine.
Plant visit to Northern Electric Company's new Wire Mill in the afternoon.
Dinner and Entertainment (Ladies Invited) in the evening.

April 29th: Technical Sessions starting at 10 A.M.
Papers will cover wet and dry lubricants, controls and material handling.

Reservation cards are being mailed to members in the U.S.A. If you, by any chance, have not received one, please write for it. This will be a big event; please come!

REGISTRATION FEE: $5.00; DINNER TICKETS: $5.00

ALLEN B. DOVE, Chairman
P.O. Box 460, Montreal,
P.Q., Canada.

H. MILLER, Secretary
Northern Electric Co.
Montreal, Canada.

RICHARD E. BROWN, Executive Secretary

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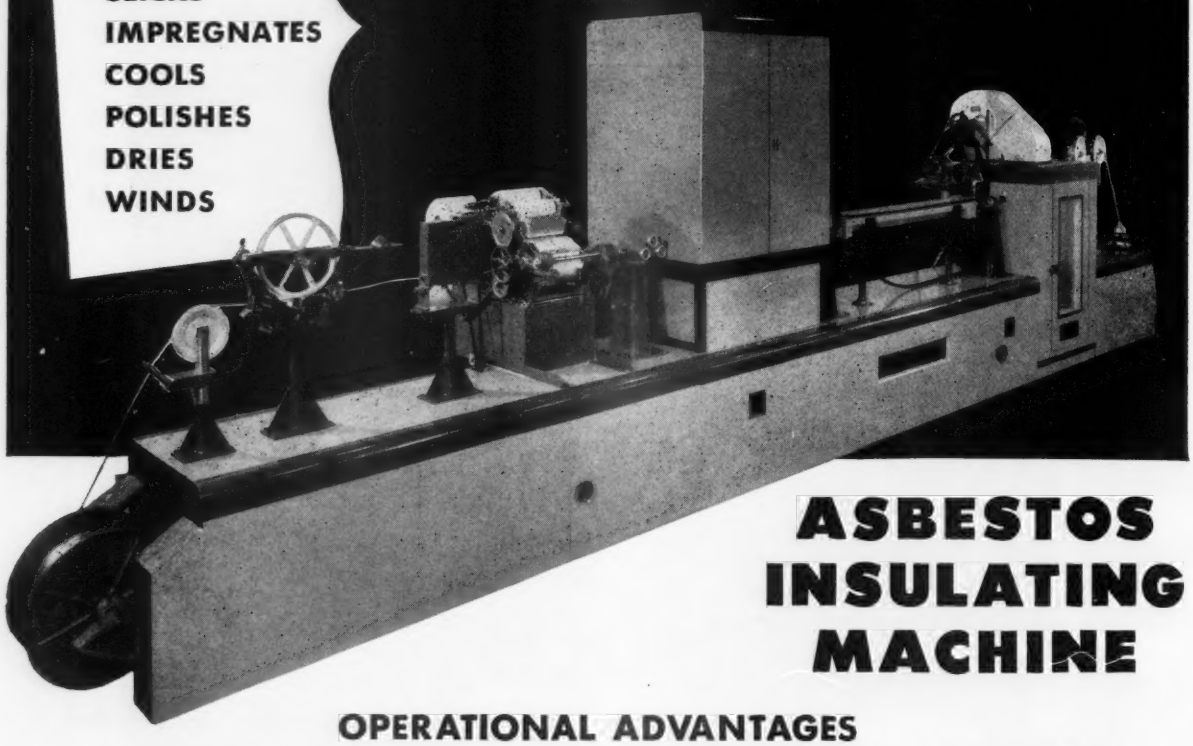

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If you are interested in increased production and lower costs through the use of similar modern equipment, we'll be glad to send you further detailed information on this machine and many others IOI designs and builds for leaders in the wire industry. If you prefer, an IOI sales engineer will call at your request.

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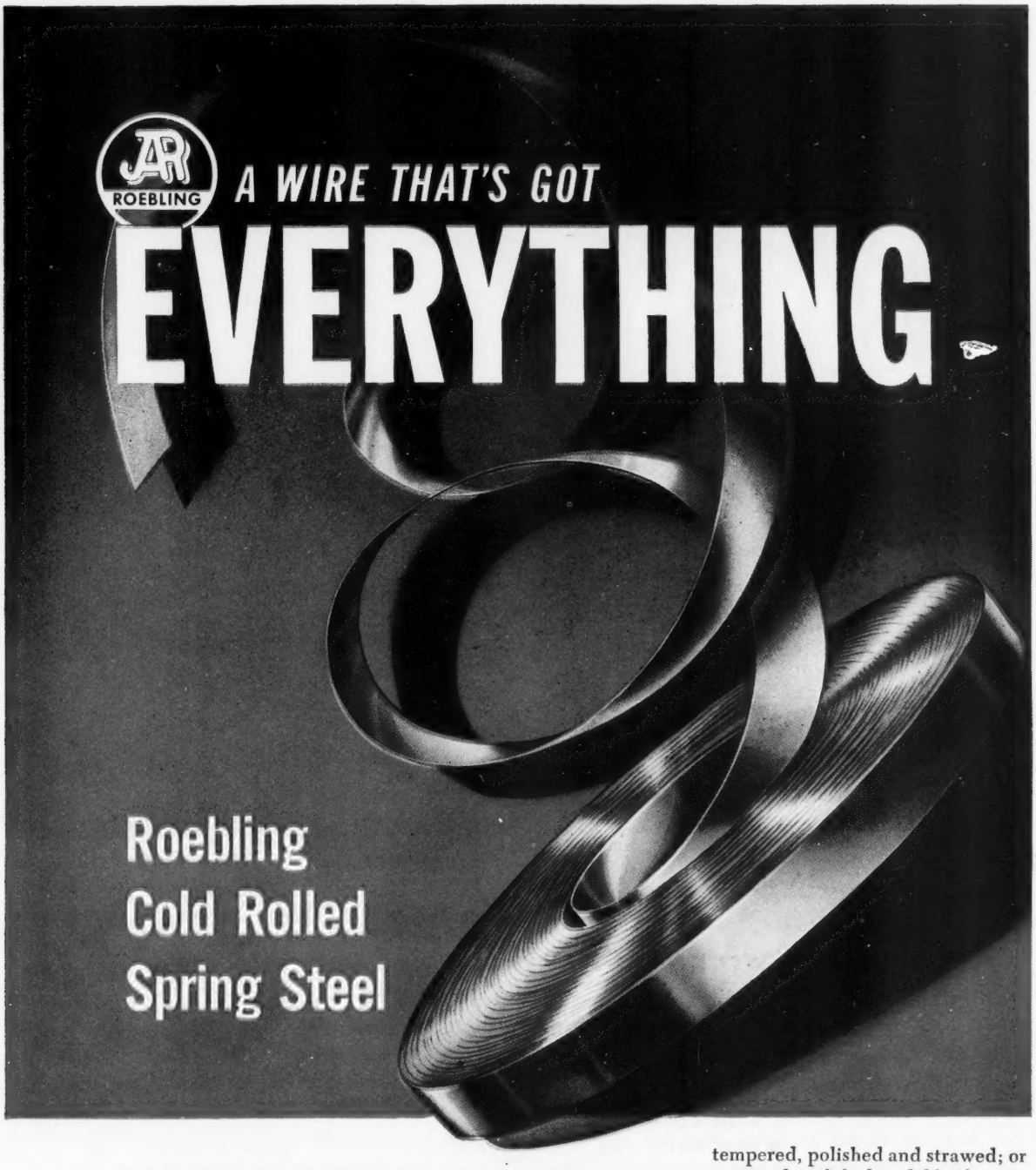
ASSOCIATED COMPANY: JAMES' DAY MACHINERY LTD., LONDON W.1, ENGLAND



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YOU KNOW what happens when you use wire uniform in gauge, grain, analysis, temper and finish. You save time and money... production goes up . . . stoppages and rejects come down. And those are the reasons why more and more manufacturers are adopting Roebling Cold Rolled Spring Steel.

With carbon content above 0.40%, you can now get Roebling Cold Rolled annealed and hard rolled untempered in bright finish. In the higher carbon ranges it is available tempered, in scaleless tempered; tempered and polished; tempered, polished and strawed; or tempered, polished and blued.

Have your Roebling representative help you select the *right* cold rolled spring steel, or round or shaped wire, for outstanding performance and worthwhile economy on your production lines and in your products. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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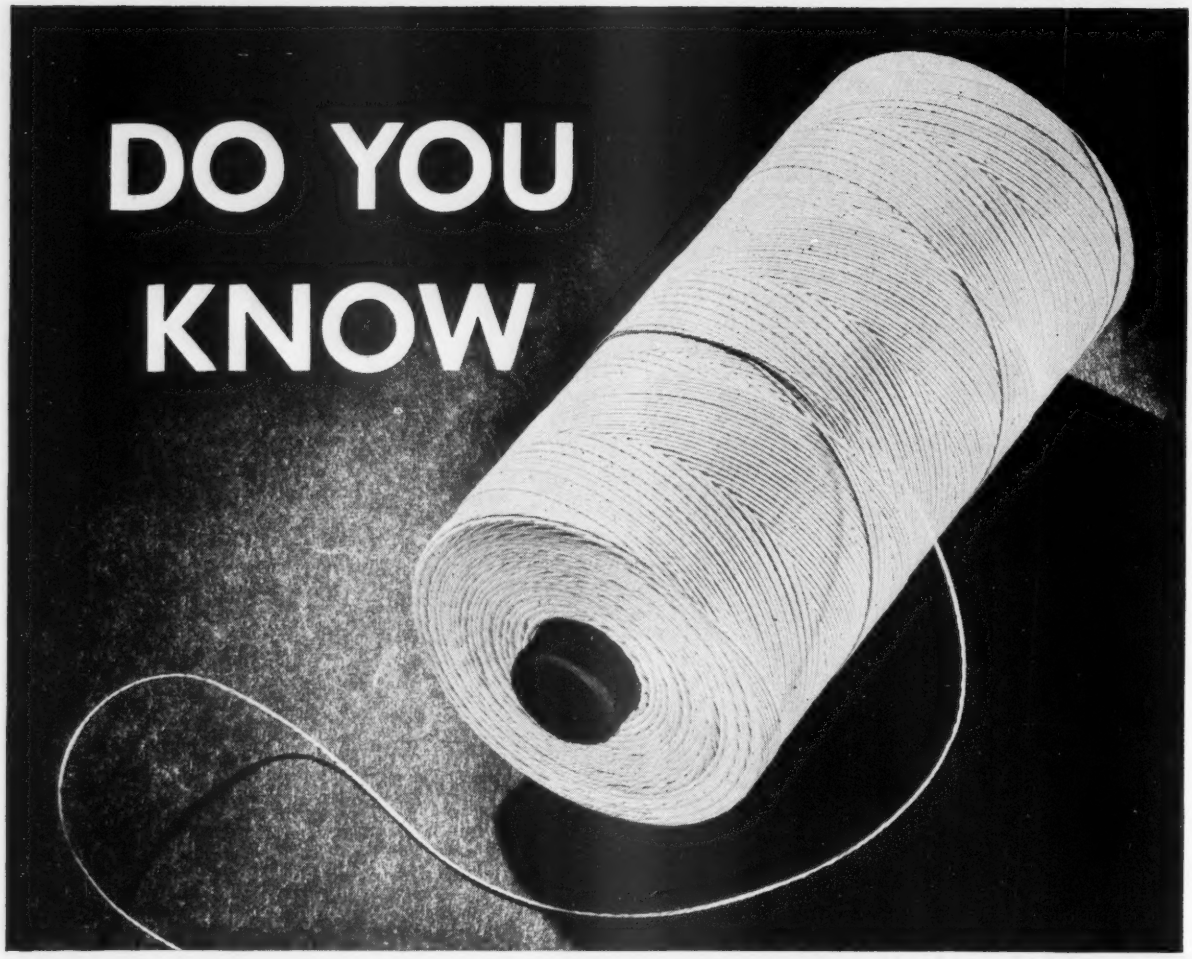
Atlanta, 934 Avon Ave. ★ *Boston,* 51 Sleeper St. ★ *Chicago,* 5525 W. Roosevelt Rd. ★ *Cleveland,* 701 St. Clair Ave., N. E. ★ *Denver,* 1635 17th St. ★ *Houston,* 6216 Navigation Blvd. ★ *Los Angeles,* 216 S. Alameda St. ★ *New York,* 19 Rector St. ★ *Philadelphia,* 12 S. 12th St. ★ *Pittsburgh,* 855 W. North Ave. ★ *Portland, Ore.,* 1032 N. W. 14th Ave. ★ *San Francisco,* 1740 17th St. ★ *Seattle,* 900 First Ave.

ROEBLING

☆ A CENTURY OF CONFIDENCE ☆



. . . why Fiberglas* 150's Yarns are being used for supporting braids or wraps for the jackets of portable cords?

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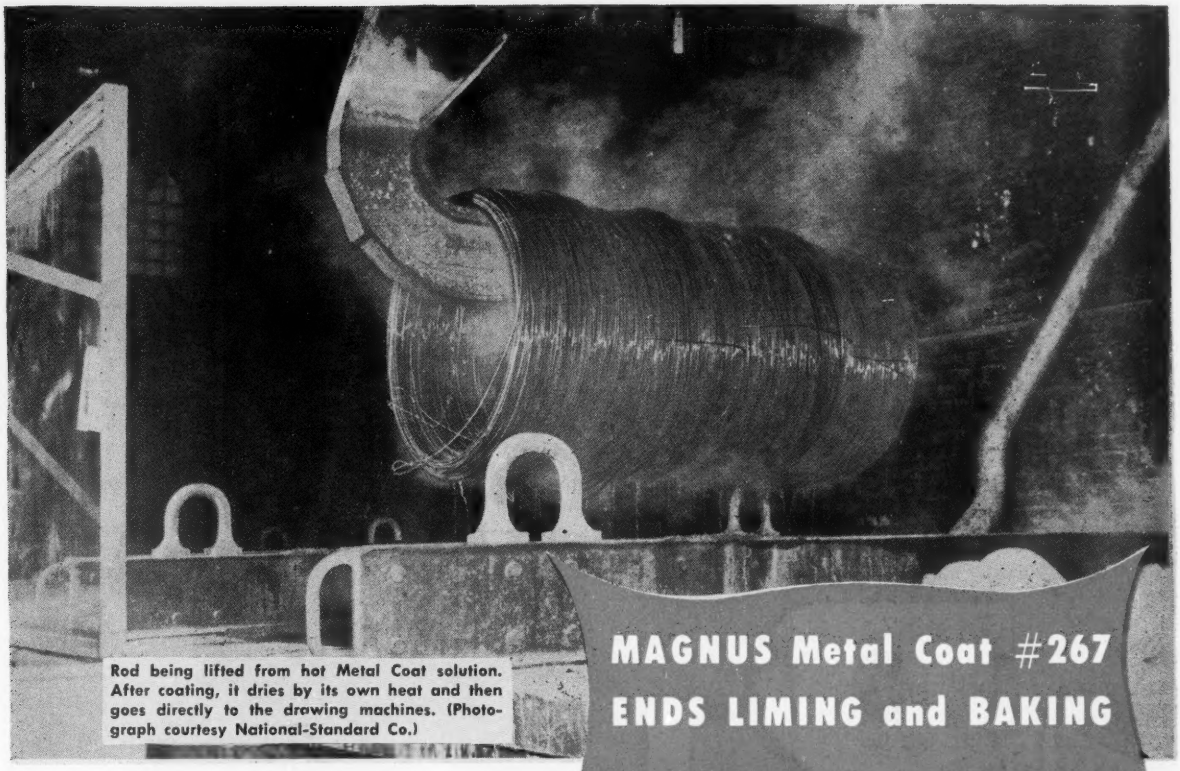

Rod being lifted from hot Metal Coat solution. After coating, it dries by its own heat and then goes directly to the drawing machines. (Photograph courtesy National-Standard Co.)

MAGNUS Metal Coat #267 ENDS LIMING and BAKING

•

You Get Speedier Drawing ... Better Finishes ... Reduced Rejects and Clean Working Conditions

THE old-fashioned lime coating method of drawing steel wire is as obsolete in 1949 as the horse-car. The newer wire mills are building MAGNUS #267 right into their cleaning houses, thus saving the expense of bakers.

Older, long-established wire mills are finding the switch from lime and baking a very simple operation. All it requires is a regulation steel tank, heated by enclosed steam coils, plus a hot air dryer for fine sizes of wire.

The method of using #267 is simplicity itself, and the man-hours saved, plus savings in lubricant and fuel, can make an appreciable difference in your manufacturing costs.

For stainless steel, also, Metal Coat #267 is the answer. No lead . . . no lime . . . no losses — just beautifully finished wire.

If you are interested in better finished wire, at a much lower over-all cost per ton, write for details.

IN WIRE DRAWING IT'S

Magnus

CLEANERS • EQUIPMENT • METHODS

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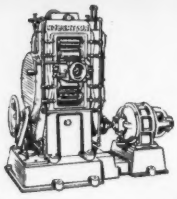

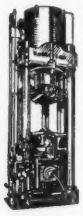

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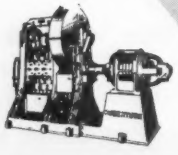

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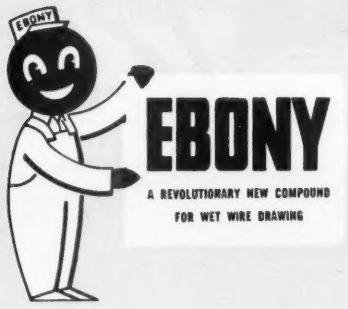

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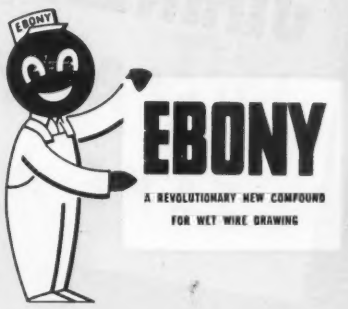

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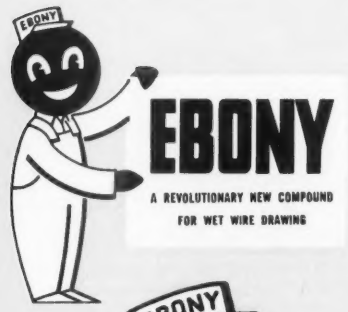

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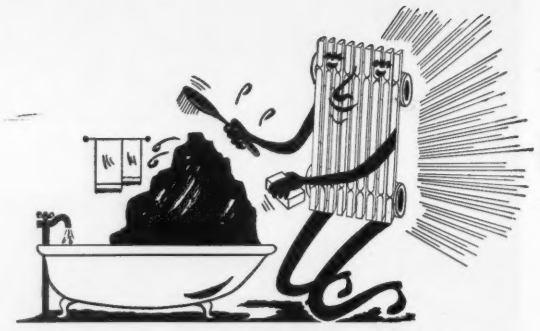

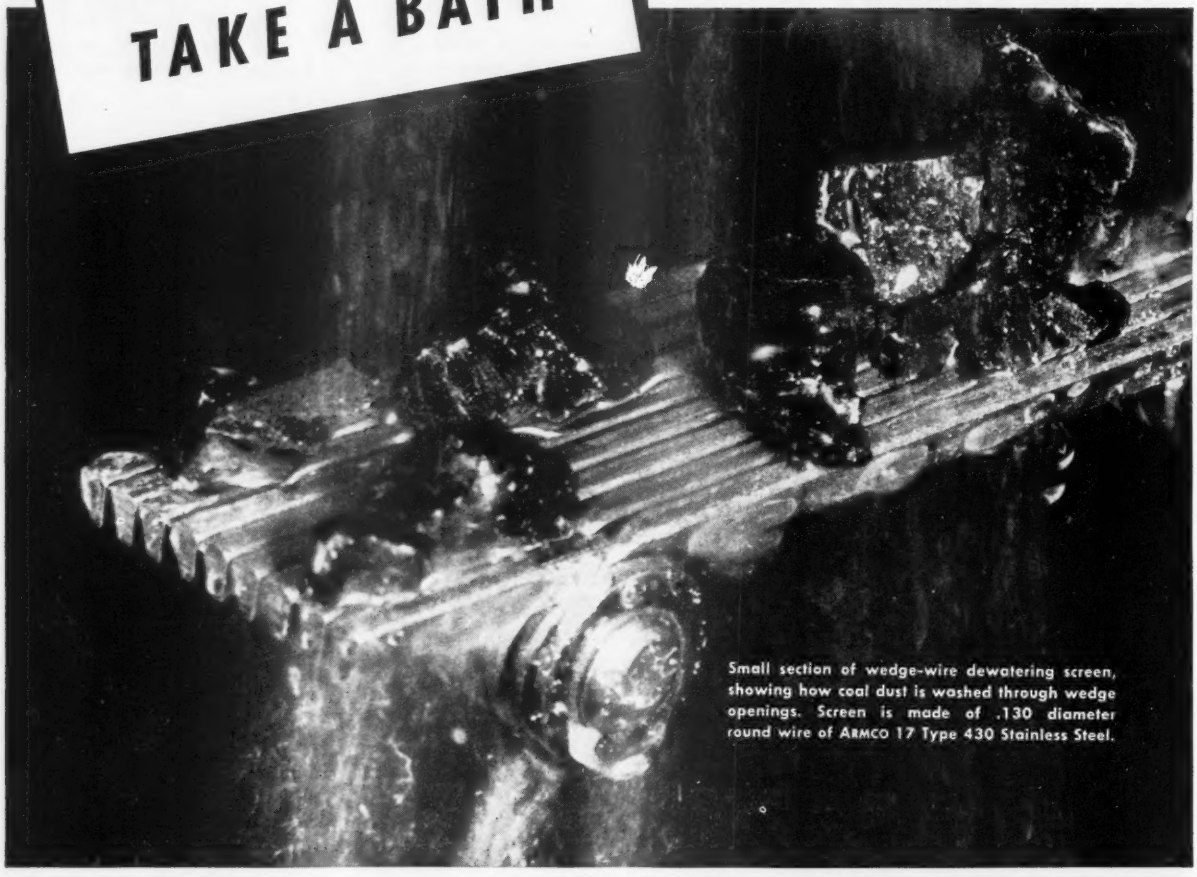

Small section of wedge-wire dewatering screen, showing how coal dust is washed through wedge openings. Screen is made of .130 diameter round wire of ARMCO 17 Type 430 Stainless Steel.

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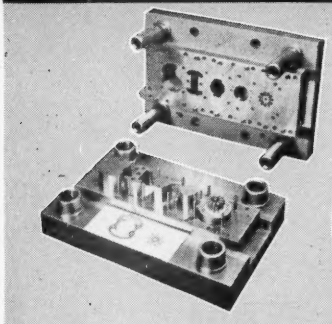

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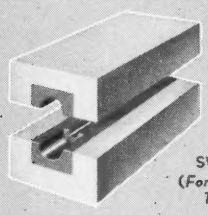

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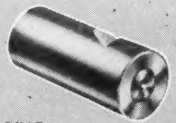

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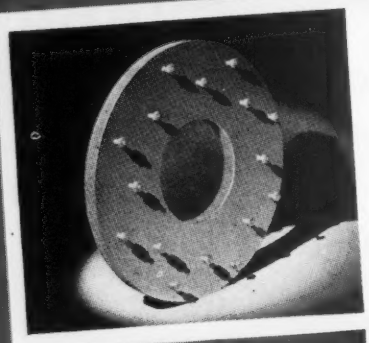

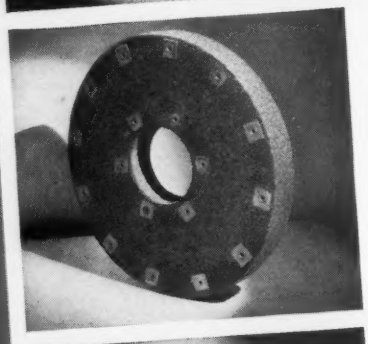

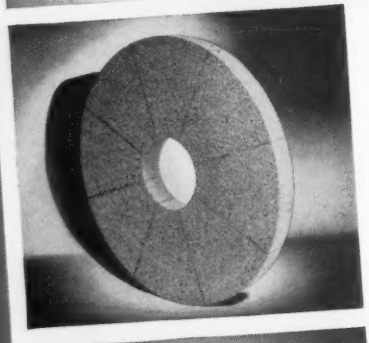

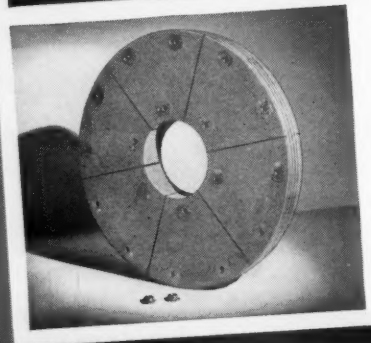

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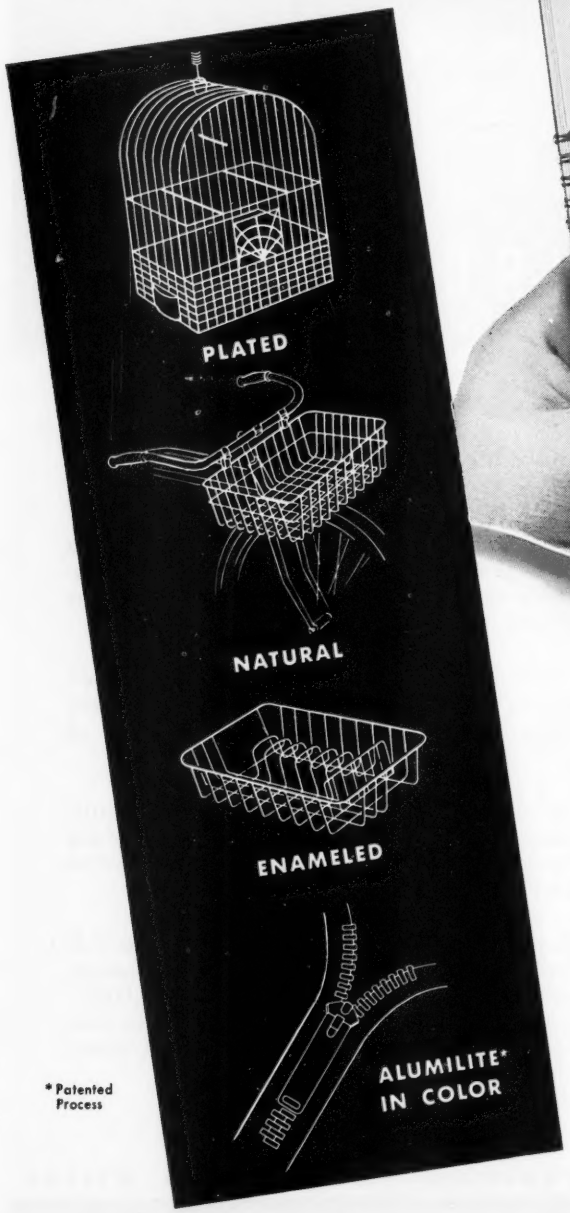

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The Wire Outlook

Despite moderate recessions in prices for some consumer lines, cut-backs in production here and there and declines in backlogs, business is expected generally to continue at boom levels through the balance of the year.

1948 wound up with a steel production of more than 88 million tons, with the last quarter production running at a rate of 94 million. By the end of this year, as a result of a post-war expansion and improvement program that will have cost the industry 2 billion dollars when completed, our steel capacity will rise to 98 million tons. All the rest of the world last year produced about 70 million tons.

All this is interesting in view of the threat of the government to build additional steel producing units if the industry itself does not further expand. Yet steel capacity has been upped 17.5% since 1938, while population has increased only 12.5%. It would seem that the administration is either uninformed or playing politics—or both.

Present capacity is adequate to serve normal demands, but has been overtaxed by the accumulated needs created by the starvation period of the war. There is much evidence to indicate that, while for the first half of the year requirements will be greater than supply, in the second half a balance will be struck that again will put the buyer in a position to get what he wants when he wants it. And the gray market, now drying up, should disappear.

New building construction this year is estimated at 18.75 billions, which, if it materializes will be 5% higher than in 1948. This will provide a tremendous market for electric wire and cable, wire rope, nails, bolts, rivets and many other products of the wire industry.

Canada is reported to have had such effective results from the austere measures taken to combat her acute dollar shortage problem, that the country is well along on the road to financial soundness. As a result, Canadian business will be allowed to make purchases totaling $50,000,000 in this country in 1949.

In the non-ferrous fields, the shortage of aluminum is going to continue to be felt. Last year, in spite of a record peace-time output, the supply ran 500 million pounds under demand. Defense requirements are taking a large amount and drought conditions affecting power have curtailed reduction processes. Copper production is running around 100,000 tons a month, with another 20,000 imported. As 1,400,000 tons are needed for 1949, the supply should be reasonably ample, provided labor troubles do not upset the apple-cart. Lead supply will be uncertain. Before the war domestic production and consumption were in fairly good balance. With 1948 consumption estimated at 1,100,000 tons, of which only 385,000 came from domestic mines, between stockpiling and the vagaries attendant upon importing the bulk of our lead, a good supply is not assured.

In wire, the soft spots are not consistent, and most wire product fabricators are taking their full allotments; over-all demand is high, especially for items made from low carbon wire. Heading wire demand is heavy. Fencing, bale ties and barbed wire are in short supply, while poultry netting is somewhat over-produced. Upholstery springs, hardware springs and those used in electrical appliances have suffered a slackening in demand. Nails, of course, are greatly short of the amounts needed. Orders for fasteners have tapered, but backlogs are still running six to eight weeks.

While business will be good, the President's message on the state of the union and the budget recommendations were not too encouraging to industrialists. Both reeked of socialization and extravagance at a time when economy and encouragement to private enterprise are needed. The truth probably is that the Administration feared that the recession might develop into a depression and that glib left-wing advisers are using a slow-witted man as a tool through which to accomplish subversive ends. All of which places the responsibility for tempering the recommendations squarely upon the shoulders of the Congress, with some indication that they will rise to the occasion already being evident.

—from the Editor's Desk

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A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

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Vol. 24 FEBRUARY, 1949 No. 2

A NEW DRAWING CHART FOR TUBES

By Yves Dardel (*)

Paris, France

MANY methods and charts have already been suggested to make easier the planning of tube drawing. But they generally do not allow for the visualization of all the operations which are to be carried out.

★ ★ ★

THE main advantage of the new chart is to give a representation of all the operations which are required for the drawing of one tube size or for the gathering and drawing of several tube sizes.

★ ★ ★

THE introduction of the new drawing chart in the planning department of a drawing shop has made easier the planning of tube drawing by non specialized clerical workers.

★ ★ ★

I. Generalities
II. Principles
III. Field of actual drawing possibilities of a tube bloom
IV. Draw-benches to be used
V. Application of the chart:
a) Drawing of a single tube size
b) Drawing of several tubes of different sizes.

Principles

WHEN S is the initial section of a tube, S' the section after the pass and A the elongation, it can be written: (Note: S' = S_1, etc.)

$$\frac{S}{S'} = A$$

or

$$\frac{S}{S'} = \frac{e}{e'} = \frac{d + e}{d' + e'} = A \quad . . (1)$$

e being the initial wall thickness, e' the final wall thickness, d the initial diameter of the bore, d' the final diameter of the bore.

★ ★ ★

THE term $\frac{e}{e'}$ is the elongation resulting from the reduction in thickness and $\frac{d + e}{d' + e'}$ the elongation resulting from the reduction in the mean diameter.

★ ★ ★

WHEN A, e and d are constant, equation (1) gives the size (e' and d') of all the tubes which can be produced from the initial tube bloom (e, d) with an elongation equal to A.

★ ★ ★

IN order to make easier the determination of the different values of e' and d', it is possible to write equation (1) thus:

$$\log \frac{e}{e'} + \log \frac{d + e}{d' + e'} = \log A$$

and to report on a chart (Fig. 1) the values of log A in function of $\log \frac{e}{e'}$ and $\log \frac{d + e}{d' + e'}$.

★ ★ ★

FOR a given tube bloom it is possible to graduate the abscissae and ordinates respectively in e' and d' + e'. All the possible values of e' and d' corresponding to a given value of A are then indicated in the chart by the coordinates of all the points of the line representative of A.

★ ★ ★

THE same chart is also valid for determining the passes following the first one. When the elongation of the first pass is equal to A_1 and that of the second pass to A_2, the total elongation after the two passes is equal to A_T or $A_1.A_2$. As the scales of the chart are logarithmical, the distance between the two straight lines A_1 and A_T gives the elongation A_2 corresponding to the second drawing pass.

★ ★ ★

THEREFORE, all the possible drawing passes of a given tube bloom, whatever their rank, can be represented on a single chart (Fig. 1).

★ ★ ★

(*) Centre de Documentation Sidérurgique, 12 rue de Madrid, PARIS.

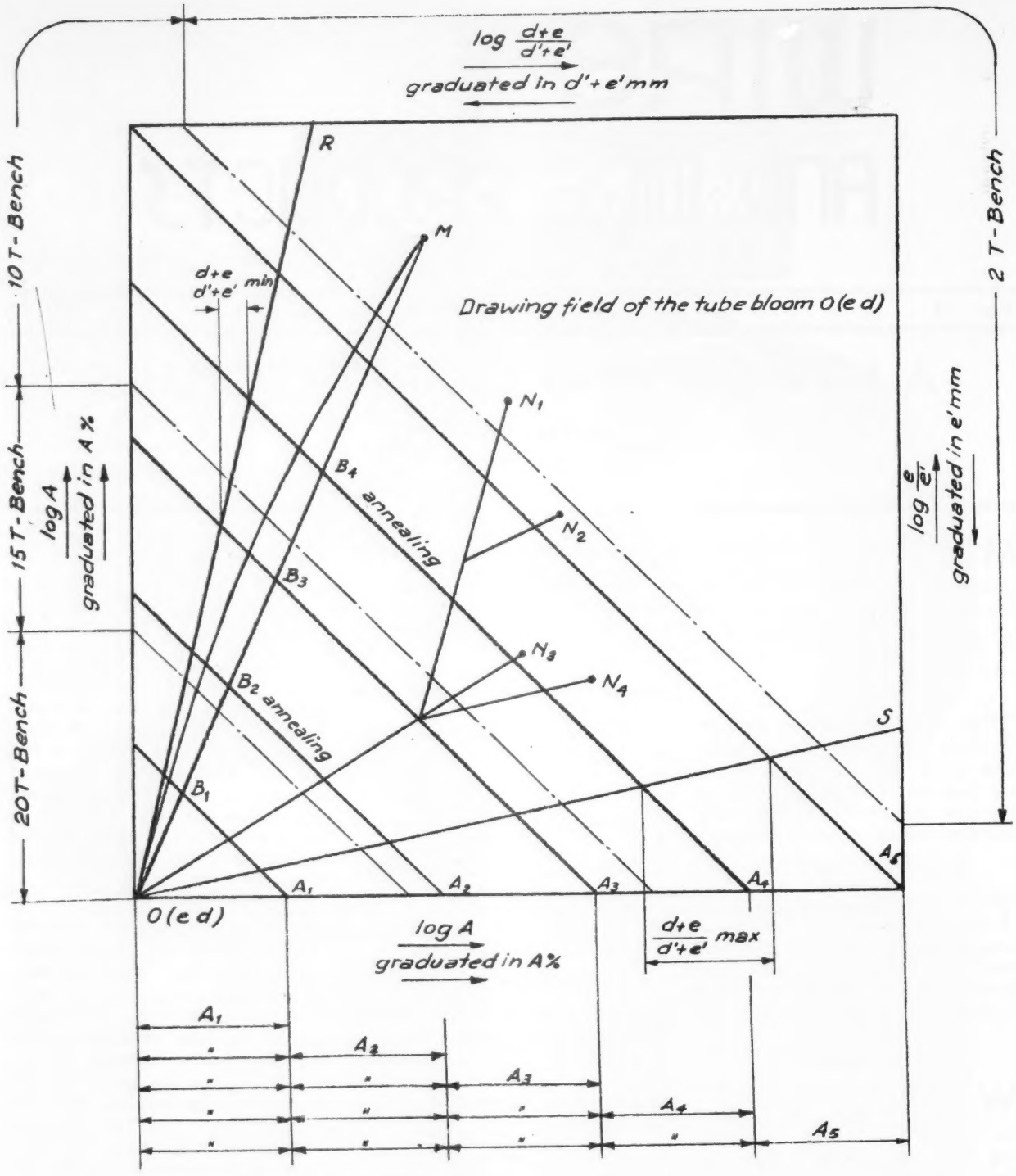

Fig. 1 Principle of the drawing chart.

THE values of the elongations A_1, A_2, A_3 . . . A_n are chosen according to the usual practice.

* * *

THE passes after which the tubes must be annealed can, if necessary, be indicated on the chart.

* * *

FOR instance, with brass 63-37 annealing must be carried out every other pass, the first being

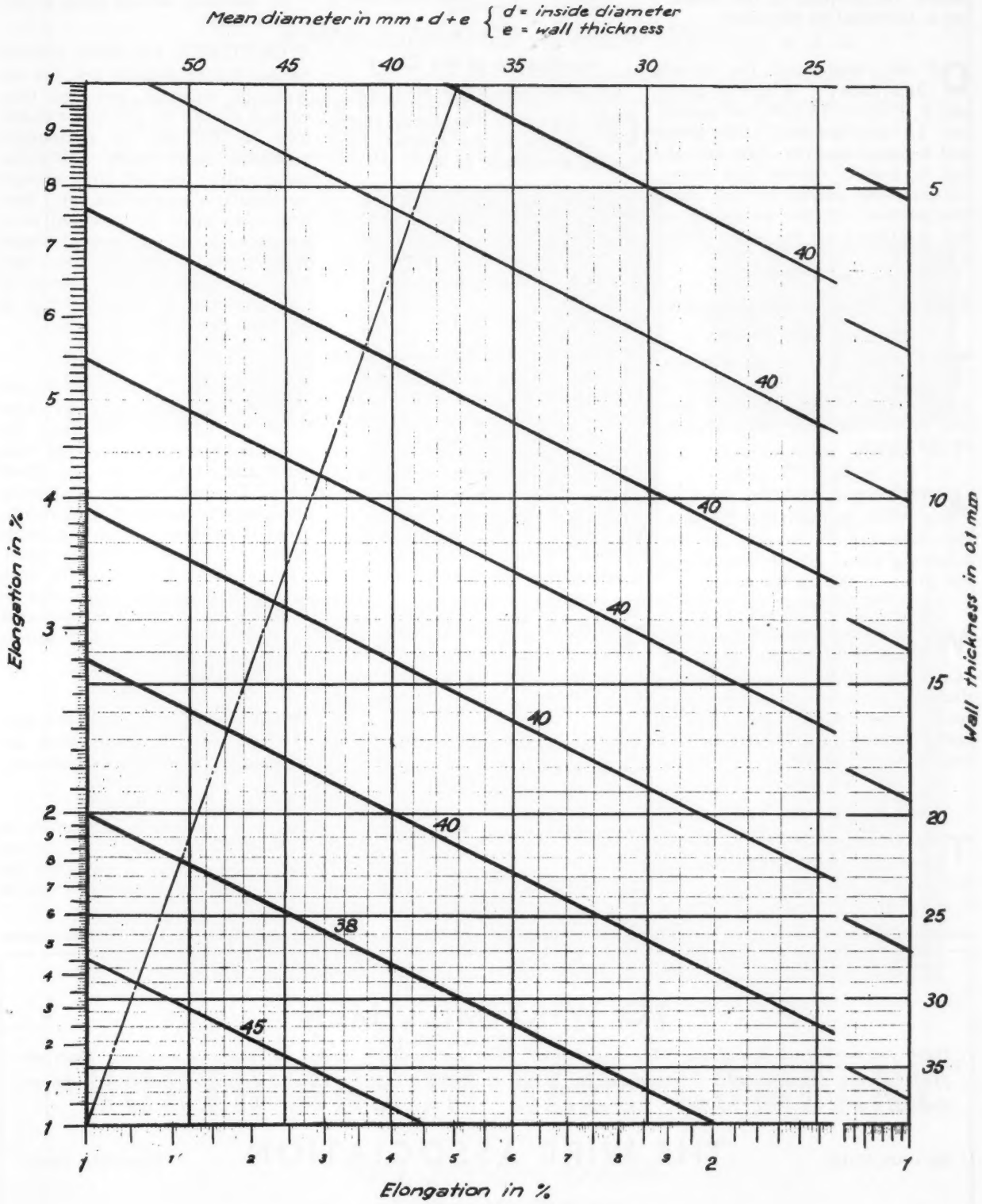

Fig. 2 Tube bloom 52 x 60 in pure copper.

equal to about 35% ($A_1 = 1{,}35$) and the second to about 25% ($A_2 = 1{,}25$). In this case, owing to the unequal value of the different passes, the position of the annealing is indicated on the chart.

★ ★ ★

ON the other hand, for copper light tube $d < 4$ in. (100 mm) and $e < 1/8$ in. (6 mm) all passes can be approximately the same and be equal to 40%. The annealing is usually carried out every three or four passes. In such case, the position of the annealing is not mentioned on the chart (Fig. 2).

★ ★ ★

Field of Actual Drawing Possibilities of a Tube Bloom

THE actual field of the drawing possibilities of a tube bloom is a little smaller than the field limited by the abscissae and ordinates of the chart.

★ ★ ★

AFTER a pass the bore must be a little greater than the outside diameter of the plug for the following pass. These limitations are given in OR on the chart.

★ ★ ★

WITH some kinds of alloys, like brass 58-42 for instance, the elongation due to the reduction in diameter must be smaller than the total elongation. The straight line corresponding to these limits has been reported in OS.

★ ★ ★

Draw-Benches to Be Used

THE resistance F of the chain has to be greater than that of the tube: $F > K \cdot R \cdot e' (d' + e')$ R being the tensile strength of the tube and K the safety factor.

★ ★ ★

ON the figure the possibilities of the different benches are reported by trapeziums.

★ ★ ★

Application of the Chart

a) **Drawing a single tube size.**

ON Figure 1 the point corresponding to the finished tube has been reported in M.

★ ★ ★

THE straight line OM crosses the lines of equal elongation $A_1, A_2 \ldots A_n$ in $B_1, B_2 \ldots B_n$ which give the characteristics of each pass.

★ ★ ★

THE number of equal elongation lines crossed by OM gives then the number of passes and the position of the annealing operations.

★ ★ ★

THE knowledge of the length of the tube calculated from the chart, and the position of the annealing, permits of determining the location of the auxiliary operations such as cutting, etc.

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THE zone in which $B_1, B_2 \ldots B_n$ are placed indicates the strength of the benches which are to be used.

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SOMETIMES, for heavy tubes, it is better to take the passes from an upward light balanced curve OCM, instead of taking them from the straight line OM.

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PRACTICALLY, for drawing tubes of a single size, such charts are only used for determining the standard technical card.

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b) **Drawing several tubes of different sizes.**

SOMETIMES, the tubes ordered by the customers are not always of standard size and they cannot always be put into production on the basis of a standard technical card alone. Besides, some orders are not large enough to justify a production lot. Several sizes must be gathered on a single work order in order to spare material and time. The new chart has been applied with success to the planning of the drawing of multiple size tubes.

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WHEN $N_1, N_2, N_3 \ldots N_n$ are the different tubes which must be drawn together, the points corresponding to these tube sizes are reported on the chart (Fig. 1), but instead of joining the origin to these different points, point O has been joined to a single point N, called splitting point. This point is determined in such a way that all the tubes can be drawn from it, but it is no longer possible to give the same passes to all tubes together.

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THE passes, as well as the auxiliary operations, are then determined as pointed out previously.

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IN this manner, it is possible to combine the passes and cutting operations in such a way that the waste of material and time can be reduced to a minimum.

TO WIRE MILL MEN

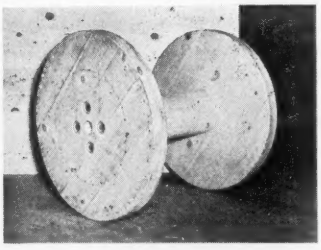
Have you considered joining the Wire Association? You are cordially invited to become a member. Dues are $15.00 a year, which includes a subscription to WIRE & WIRE PRODUCTS and a copy of the Annual Buyers Guide.

300 MAIN STREET — THE WIRE ASSOCIATION — STAMFORD, CONN.

REEL NEWS

ANNOUNCING A NEW REEL

A new metal-bound reel has been developed, combining greater strength and lower cost, that is being enthusiastically received by the Wire Industry. This reel is made in any diameter from 12" to 42", with or without tension groove. Prompt deliveries are being made and you are invited to try them in your mill.



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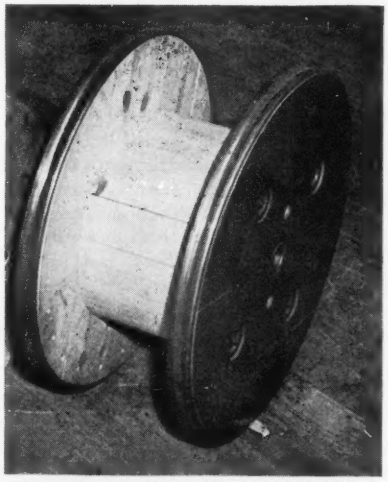
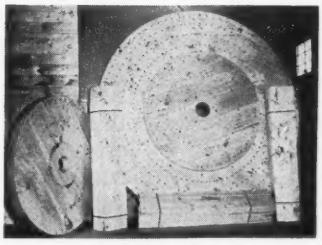


Metal-bound Reel Announced Above.



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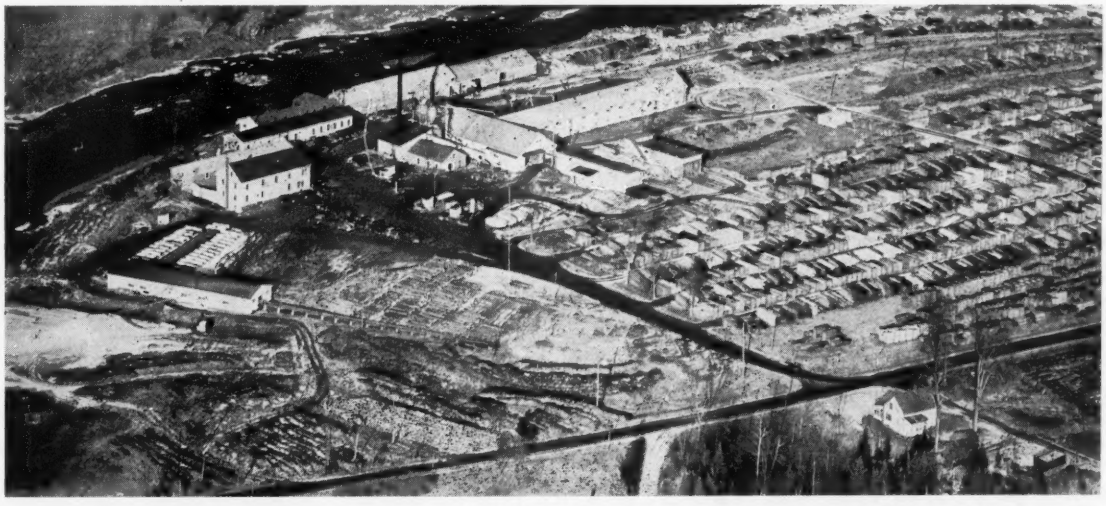

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Physical Aspects of Insect Wire Screening

By Ralph W. Bacon, Secretary,
Insect Wire Screening Bureau
New York, N. Y.

Scientific data on the physical properties of insect wire screening are now available for the first time in the history of the screening industry.

This paper summarizes the findings of the Engineering and Industrial Experiment Station of the University of Florida with respect to the physical characteristics of various types and mesh sizes of insect wire screening: relative strength, resistance to bending and abrasion, expansion and contraction, and obstruction to the free passage of light and air. These tests were financed by the wire screening industry, and were conducted independently by University of Florida engineers.

FOR the first time in the history of the industry, something factual is known about the physical characteristics of insect wire screening. On behalf of the **Insect Wire Screening Bureau,** and financed by practically 100% of the wire screening manufacturing industry, the **College of Engineering, Florida Engineering and Industrial Experiment Station, University of Florida,** has just completed a series of tests to determine the relative strength, resistance to bending and abrasion, expansion and contraction, and obstruction to the free passage of light and air, of all commonly made types of insect wire screening.

★ ★ ★

COMPLETELY aside from the corrosive or non-corrosive aspects of wire screening, these other elements, strength, rigidity, expansion, contraction and the passage of light and air should be important considerations in the sale and use of window, door and porch screening. Over the years, a great many corrosive tests have been conducted by governmental and private agencies, the results of which have been made freely available to everyone. Therefore, no work whatsoever was done on corrosion in connection with these newest tests; they were confined exclusively to the physical attributes of the product.

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IT should be borne in mind that these tests were not made to find out what strength a window screen should have in order to withstand the ordinary wear and tear it is subjected to when installed in a window. The tests merely indicate the final breaking strength or failure point of insect wire screening. The force required to reduce screening to absolute failure is probably many times that encountered by an ordinary window screen.

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CAREFUL study of the results reveals that no one type or size of wire screening is superior to all other types and sizes. That circumstance makes the results of these tests all the more valuable to those whose policy it is to sell the best for a given purpose, not just something which is "believed" to be good enough, or just wire screening as such, and nothing more. If a consumer wants to refill a battered screen door, or punched out window and porch screen frames, with something which will best withstand the impact of baseballs, rake handles, elbows and such, he is entitled to the facts as to which type of screening will stand up best under an impact load. If his wife thinks her present screens shut out too much light, or air, it would certainly be good salesmanship to be able to tell him just how much is shut out by the various types of screening; maybe he already has the best. Any kind of screening is bound to cut off some light and air.

GOODWILL, engendered by being in a position to lay the facts "on the line," is sometimes even more important to "sell" than a few dollars worth of merchandise. More often than not, having the facts immediately available results in a sale of both commodities, goodwill along with merchandise. And goodwill definitely is a commodity. It is the intangible something which brings a customer back to the same store, time after time, for his home-maintenance and construction needs.

★ ★ ★

THE sizes and kinds of insect wire screening tested by the University of Florida comprised:

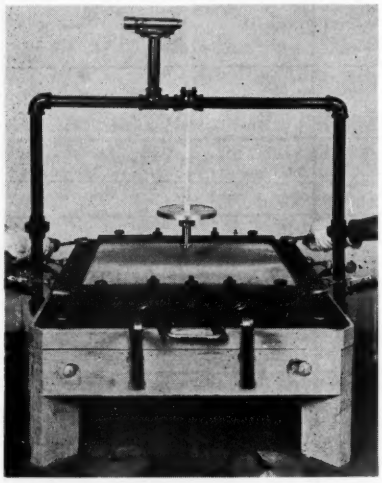
Bronze	**18x18**	**mesh**	**.011″**	**wire**	
"	**18x14**	"	**.011″**	"	
"	**16x16**	"	**.011″**	"	
Copper	**18x14**	"	**.011″**	"	
Galv. Steel	**18x14**	"	**.011″**	"	
" "	**16x16**	"	**.011″**	"	
Aluminum	**16x16**	"	**.0126″**	**x .0138″ wire**	

★ ★ ★

Impact-Load Test

IN addition to the bare figures shown in the accompanying tables, it is interesting to know something about how these various tests were conducted; the equipment that was used and how the work was done. Taking up the impact-load test first, it was obvious that some means would have to be provided for holding wire screening samples secure, with no possibility of slippage or distortion of the mesh, if anything like a scientific determination was to be reached as to how much load (weight) could be dropped on them before they fractured. No laboratory or standard factory type of apparatus was available for such a purpose so the University of Florida, College of Engineering, designed and built one especially for these tests.

A HEAVY oak frame, grooved all around to take four "tongued" clamps, fitted with suitable bolts and nuts for tightening the clamps down into the sheet copper lined grooves in the frame, was mounted on a solid base which no conceivable load could spring or sag. Pieces of wire screening, approximately 20″ x 20″ were then cut and carefully punched, on a specially constructed template, to insure a precise fit over the clamping bolts in the frame without any deflection or strain on the material. When securely clamped into the frame, increasing weight-loads were dropped from a precisely



A screening sample being tightened in the apparatus for testing resistance to impact-load. (Table A.) Steady-load tests (Table B) were also made on this specially constructed equipment.

measured height onto the exact center of the mounted sample. Immediately following each "drop," the screening sample was carefully inspected for fracture, or permanent distortion of the mesh, sufficient to throw it out of line with the limitations and tolerances of Commercial Standard CS138-47 for Insect Wire Screening.

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FOUR types of "heads," spherical, ovoid (door-knob), round flat-disc and square flat-disc, were employed in this and the steady-load test. Each head was mounted on the bottom end of a ½″ square aluminum shaft, on the top section of which increasing weights could be affixed until the resultant blow, when dropped, fractured the screening sample. The rebound was caught at each drop by means of a ratchet device securely fastened to the shaft. Tabulated results of this test will be found in Table A.

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Steady-Load Test

FOR the steady-load tests, the same apparatus and types of heads were employed as for the impact-load tests. In procedure, the only difference was that instead of dropping the loads, they were gradually piled on, pound by pound, until the samples fractured. The results of this test will be found in Table B.

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Tensile Strength Test

FOR the tensile strength tests, steady pull, a standard piece of apparatus was available. This device is known as the **Scott Testing Machine** which conforms to the American Society for Testing Material, Standard 76-44, for testing

TABLE A
IMPACT-LOAD TEST
All Figures Represent Impact In Inch-Pounds at Point of Fracture

Screening Type	Ovoid Head	Spherical Head	Round Disc Head	Square Disc Head	Average Values
16x16 Mesh Galv. Steel	42.3 31.2 28.4	14.3 13.9 12.16	28.1 28.05 21.1	20.45 20.2 19.6	26.3
18x14 Mesh Galv. Steel	31.9 21.9 19.5	11.05 10.3 7.20	33.2 24.0 16.1	27.4 21.45 19.7	25.9
18x18 Mesh Bronze	23.15	12.1 11.1	23.2 19.0	15.5 14.9	18.5
16x16 Mesh Bronze	21.2 18.7	11.3 10.4	19.04	20.0 14.9	17.9
18x14 Mesh Bronze	14.4	11.7 11.4 8.73	15.5 12.4 10.62	18.2 15.95 11.55	14.9
18x14 Mesh Copper	18.56 9.52	5.37	10.28 8.78	10.54	11.2
16x16 Mesh Aluminum	11.1	6.86	14.4	11.01	10.8

TABLE B
STEADY LOAD TEST
All Figures Represent Pounds of Load at Point of Fracture

Screening Type	Ovoid Head	Spherical Head	Round Disc Head	Square Disc Head	Average Values
16x16 Mesh Galv. Steel	205	78	144	142	142
18x14 Mesh Galv. Steel	168	62	88	80	99.5
18x18 Mesh Bronze	114	88	122	74	99.5
16x16 Mesh Bronze	74	78	86	128	91.5
18x14 Mesh Bronze	88	62	58	72	70
18x14 Mesh Copper	48	28	62	66	51
16x16 Mesh Aluminum	76	54	66	82	69.5

woven textile fabrics. It is a sturdy, power driven machine which will produce a uniform pull of 12 inches per minute, under any given load, within the capacity of the machine which in these tests, well exceeded the breaking-point resistance of the specimens of wire screening under observation. Resolved to simple terms, this test means that samples of wire screening, 4" x 6", were securely clamped into a device which pulled them apart, first one way (warp), then the other (filler). The results are noted in Table C.

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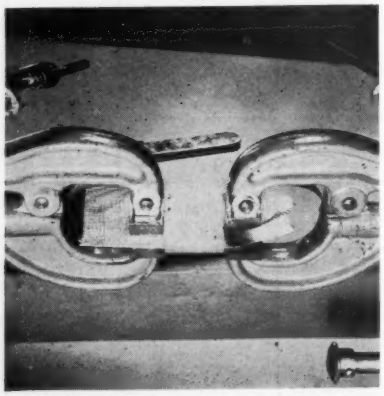
Resistance to Abrasion Test

FOR determining resistances to abrasion, another standard



Tensile strength tests of insect wire screening were made in this Scott testing machine. (Table C.)

piece of apparatus was available. This machine is known as a Taber Abraser which is a comparatively small, heavy-base, bench type, of apparatus equipped with two abrasive wheels of a standard type, H-22 Calibrade, revolving freely in opposite directions, clockwise and counter clockwise, against a power driven flat disc upon which the screening samples were securely mounted by means of a centrally located set-screw clamp. The action obtained, was one of uniform rubbing and scuffing, tending to wear through as well as separate the wire strands of the screening. The results, as noted in Table D, were recorded in terms of cycles or full turns of the disc.

The Taber Abraser tested resistance to abrasion of various screening samples. (Table D.)

Obstruction to Free Passage of Light and Air

THE obstruction to free passage of light and air tests may well be considered jointly because the results of both of these tests developed comparable results. In any given sizes of mesh, woven from the same size (diameter) of wire, obstruction to the free passage of both light and air, is directly re-

TABLE C
TENSILE STRENGTH TEST
All Figures Represent Pounds of Pull at Point of Fracture

Screening Type	Warp	Filler	Total Average Values
16x16 Mesh Galv. Steel	164.5	180	172
18x14 Mesh Galv. Steel	166.5	135	151
18x18 Mesh Bronze	156	190.5	173
16x16 Mesh Bronze	144	145	144
18x14 Mesh Bronze	173	121.5	147
18x14 Mesh Copper	104	85	94
16x16 Mesh Aluminum	108	127	117

TABLE D
ABRASION TESTS

Type of Screening	Number of Wear Cycles at Failure	Type of Failure
16x16 Mesh Galv. Steel	120	Even wear: no spread of warp.
18x14 Mesh Galv. Steel	25	Warp wires spread: very little wear noted.
18x18 Mesh Bronze	100	Uniform wear: warp had three strands broken.
16x16 Mesh Bronze	60	Warp spread and wore.
18x14 Mesh Bronze	50	Warp spread.
18x14 Mesh Copper	44	Uniform wear: eight warp wires wore through.
16x16 Mesh Aluminum	85	Uniform wear: most of warp and six filler wires wore through.

lated to the size of opening subject to surface roughness or finish. That is a common sense conclusion which was borne out by these scientific tests. Special apparatus had to be designed and constructed (separately) for these two tests. The same 8″ x 28″ screens (wood frame) were used for the "front end" of both tests, but the backgrounds had to be vastly different. In the light test, the basic principle was to check the screening at various pre-determined angles, to give all samples equal opportunity to transmit light, directly and by reflection. The first recordings of light transmission were made with no screen at all over the opening. Then, one by one, framed specimens of wire screening were affixed across the opening and all results were measured against the initial readings obtained with no screening at all. The data thus obtained are set forth in Table E.

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THE "background" apparatus for testing obstruction to the free passage of air, as stated, had to be radically different from the comparatively simple blackened-box device which served satisfactorily for the light tests. A 4-foot cube air mixing chamber was constructed with a 16″ square baffle, mounted 12″ in front of the inlet, in order to deflect the air stream and produce a constant pressure across the entire screened opening. Readings on such technical devices as a micro-manometer, and a velometer, were taken at full flow, which approximated a wind velocity of 12 miles per hour, ¾ flow and ½ flow. The results, as shown in Table F, are in almost direct ratio to the size of the open area in wire screening except that relative smoothness of wire surface was also found to be a governing factor in the flow of air through wire screening.

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Resistance to Bending

THE object of this test was to determine how far (to what angle) each kind of screening could be bent and, when released, spring back to its original flat plane. The results could very well be interpreted in two diametrically opposite ways. Screening which will bend easiest, and to the greatest angle, without permanent crease or "set," would be least likely to crease in ordinary handling and installation operations. But that same "maximum" screening, by the same token, would possess a minimum of rigidity and therefore, be the most difficult to handle in normal installation operations.

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TWO samples of each size and kind of screening, both 8″ wide, but one 12″ and the other 18″ long, were mounted in a specially constructed piece of apparatus equipped with an electrical contact gauge so adjusted as to ring a bell when the permanent "set," or deflection, reached a maximum of .025″ from a true flat plane (surface). Each specimen of screening was bent in turn over a ¼″ and then a ½″ mandrel, mounted on the front edge of the machine. The findings from this test are recorded in Table G.

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Expansion and Contraction Tests

FOR this series of tests it was believed that subjection of wire screening samples, suitably mounted (tacked) in wood frames, to a temperature range of 160° F. down to 130° below zero F., should embrace all conditions of heat and cold which wire screening would ever have to meet in actual use.

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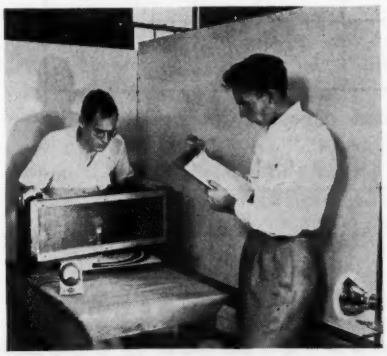
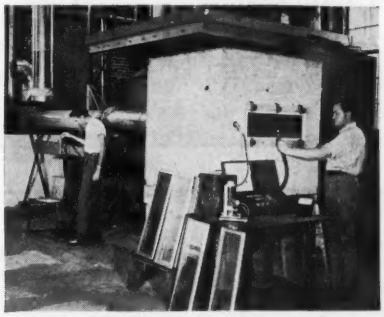
NO method could be devised whereby the wire screening, and not also the wooden frames,



Personnel of the Engineering and Industrial Experiment Station of the University of Florida test the transmission of light through a screening sample. (Table E.)



This specially constructed device was used to measure transmission of air through different types and mesh sizes of insect wire screening. (Table F.)

TABLE E
OBSTRUCTION TO
FREE PASSAGE OF LIGHT

Screening Type	Open Area Reduction	Light Passage Reduction
Control (Empty Frame)	0	None
16x16 Mesh Galv. Steel	32.1%	36.3%
18x14 Mesh Galv. Steel	32.3%	32.8%
18x18 Mesh Bronze	35.7%	38.6%
16x16 Mesh Bronze	32.1%	32.5%
18x14 Mesh Bronze	32.3%	35.1%
18x14 Mesh Copper	32.3%	37.4%
16x16 Mesh Aluminum	37.8%	41.8%

TABLE F
OBSTRUCTION TO
FREE PASSAGE OF AIR

Screening Type	Open Area Reduction	Air Passage Reduction
Control (Empty Frame)	0	None
16x16 Mesh Galv, Steel	32.1%	16.5%
18x14 Mesh Galv. Steel	32.3%	15.8%
18x18 Mesh Bronze	35.7%	10.5%
16x16 Mesh Bronze	32.1%	9.5%
18x14 Mesh Bronze	32.3%	8.9%
18x14 Mesh Copper	32.3%	10.1%
16x16 Mesh Aluminum	37.8%	13.5%

TABLE G
BENDING TEST

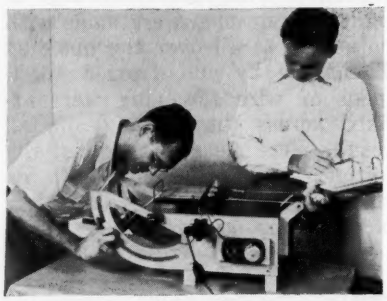
Angle of Bend Required to Produce Permanent Set

Screening Type	Degree of Bend Over ¼" Dia. Mandrel		Degree of Bend Over ½" Dia. Mandrel	
	8" x 18" Specimen	8" x 12" Specimen	8" x 18" Specimen	8" x 12" Specimen
16x16 Mesh Galv. Steel	45°	55°	65°	75°
18x14 Mesh Galv. Steel	55°	65°	75°	65°
18x18 Mesh Bronze	75°	65°	80°	80°
16x16 Mesh Bronze	70°	65°	80°	75°
18x14 Mesh Bronze	80°	80°	95°	80°
18x14 Mesh Copper	55°	65°	55°	65°
16x16 Mesh Aluminum	75°	75°	80°	80°

All of the above were bent across the warp wires

would carry the full load of heat and cold, which may or may not account for the fact that none of the samples pulled away from the frames nor did any of them show a deflection (bulge) of more than .002″ from the initial readings at room temperature. It therefore seems safe to conclude that extremes of heat and cold do not, in themselves, constitute factors of any importance in the life and satisfactory performance of window, door and porch screens when mounted in wooden frames.

* * *



A screening sample is tested to determine its resistance to bending (Table G.) * * *

WORCESTER REGIONAL MEETING

Sheraton Hotel, Worcester, Mass.

April 22, 1949, 7 P.M., Dinner and Session

Full details will be announced in the March issue of WIRE AND WIRE PRODUCTS. Meanwhile you are urged to make your plans to attend this annual timely and interesting event. All wire men are cordially invited.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET STAMFORD, CONN.

MERCHANT WIRE PRODUCTS

By H. A. Caldwell and C. L. McGowan

Chief Metallurgist
Tennessee Coal, Iron & Railroad Co.
United States Steel Corporation Subsidiary
Birmingham, Alabama

Superintendent
Wire Mill, Atlantic Steel Company
Atlanta, Georgia

Paper presented by H. A. Caldwell before the Regional Technical Meeting of the American Iron & Steel Institute in Birmingham, Alabama, on October 27, 1948. Printed by permission of the American Iron & Steel Institute.

THE manufacture of wire is an ancient art. The first wire was produced by hammering, shearing and soldering, but production by drawing, essentially in its present form, has been practiced since the Middle Ages.

* * *

IT has been established, and interestingly reported in a paper by Mr. K. B. Lewis, that about 1000 A.D. the use of tapered holes in hard plates had developed into the actual drawing of soft metals, but probably not of iron. In the period between 1300 and 1350 the wire-drawing process was extended to cover iron, and by 1430 iron wire was made essentially as it is today.

* * *

THE wire business from the start has evidently been a complicated and specialized industry. Bonzel quotes a thirteenth century ordinance of the City of Paris,

> **Whosoever would enter the wire business, it is required of him that he know the trade, and that he have what it takes.**

* * *

THE town records of Coventry, England, in 1430 give the names of the members of a Wire Workers Guild, listing the members as rod makers, annealers, coarse-wire drawers and fine-wire drawers. Five years later, September 14, 1435, there is an entry on the town record which is probably the earliest record of a customer complaint in the wire industry. It reads:

> **Sir, I had of you of late bad wire: Sir, amend your hand, or in faith I will not more buy of you.**

* * *

THE first wire-drawing mill in America was established in Norwich, Connecticut, in 1775. This was followed by several others, but none of these were permanent, and there was no wire industry of importance in the United States until the mill of the Washburn, Moen and Company was established in 1831 at Worcester, Massachusetts. Since its establishment, the industry in this country has grown enormously due to inventions that have opened up new fields for the use of wire. The first of these new major uses was steel wire rope, introduced in 1840, followed by the first telegraph line in 1844; the telephone; barbed wire and bale tie wire; steel wire nails, and the beginning of the manufacture of woven-wire fencing by machinery in 1884. All these new uses required enormous amounts of wire, and in addition there has been the development of innumerable smaller uses for wire, increasing the demand until the wire business has become one of the larger branches of the steel industry. The importance of wire, and the extent of its use, can be judged by the fact that the American Iron and Steel Institute's preliminary estimate of the amount of wire and wire products shipped by the industry in 1947 was 4,174,602 tons, or 6.6% of all steel products shipped.

* * *

Method of Manufacture

FUNDAMENTALLY, steel wire is manufactured in the same way as when the first iron wire was drawn about five hundred years ago. While there has been great improvement in the quality of the die material, and developments in the use of power, and refinements in the auxiliary equipment, and especially, improvements in the quality and uniformity of section of the rods from which the wire is drawn resulting from the development of the modern rod mill, the wire-drawing process is essentially the same.

* * *

IN the manufacture of wire, a hot-rolled, coiled rod of approximately round cross-section is drawn through a tapered hole of a die, or series of dies with successively smaller holes, until the required finished diameter is obtained. Each rod coil represents the material from a single billet and generally varies in weight from 200 to 800 pounds. The rods may vary in size from 47/64 inch diameter down to No. 5 rod, which has a nominal diameter of .218 inch. The rod, of course, has to have a larger diameter than the wire to be made from it. As No. 5 rod has the smallest diameter that can be hot-rolled practicably, it is almost universally used for drawing common round wire and fine wire of No. 8 gauge and finer, and is considered the standard rod.

* * *

BEFORE drawing, the scale must be removed from the rod, usually by pickling in hot, dilute sulphuric acid. The rods are then thoroughly rinsed in water. For a certain type of finish, the rods may be "sulled" at this stage, that is, they are placed in racks and kept moistened until covered with a brownish coating of ferrous hydroxide. Whether or not the rods are sulled, they are dipped in

vats of hot hydrated lime, which gives them a whitewash coating. The rods are baked for several hours, which dries the coating and eliminates any hydrogen that might have been absorbed in the pickling operation. The lime coating neutralizes any remaining pickling acid and protects the surface of the rods from oxidation until ready to draw, but its most essential function is to act as a lubricant in drawing.

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THE wire-drawing die is a small plate containing one or more tapered "die holes." The material surrounding the hole must have a high degree of strength and be extremely hard and wear-resistant to withstand the abrasive action of the drawing. Originally, chilled cast iron and heat-treated alloy steel were used for die material, but now the use of a carbide nib encased in an annular supporting ring of steel is almost universal. The die holes are tapered to provide a gradual reduction in the section of the wire being drawn. The exact design varies with the speed of drawing, size and kind of stock, and type of finish required on the wire. In general, however, all die holes consist of four zones; (1) the entry zone, which is larger than the wire being drawn and allows the entry of the die lubricant, which adheres to the rod or wire; (2) the "smoothing out" zone, where most of the reduction of section takes place; (3) the "bearing" zone, which tapers slightly toward the exit, and where the shape and size of the wire is determined; and (4) the "countersink," which prevents the edge of the hole from breaking away.

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TO start the drawing, one end of the rod is pointed or tapered, and threaded through the die hole, where it is grasped by tongs and drawn through far enough to be attached to a power-driven block, which pulls the rod through the die and coils the resultant wire.

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IN single-draft drawing, the wire is drawn through one die at a time and coiled. If more than one draft is required, the wire is removed from the block and redrawn through the next smaller die until the desired size is obtained. In continuous drawing, wire is drawn in one operation through a series of dies with power-driven blocks between the dies. The blocks operate at successively higher speeds, and the wire is coiled on the last block.

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IN drawing, it is essential that lubricants be used to cut down on the power required, minimize die wear and protect the wire surface from being scratched. In dry drawing, which is the type almost exclusively used for merchant wire, the basic lubricant is the lime coating baked on the cleaned rod, supplemented by grease or soap added to the die box.

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THE procedure for finishing the wire after the first draft varies greatly according to the use for which the wire is made. One draft may be all that is necessary, but hard, bright wire may be obtained by additional drafting. If much ductility is required, annealing must be done, either in process, or after the last draft, depending on the surface finish and degree of softness necessary. Other operations after drawing, dependent on the use of the wire, are galvanizing or tinning, straightening and cutting, special packaging, etc.

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Mechanical and Chemical Properties

THE mechanical properties of wire are determined by a number of factors, such as the chemical composition and quality of the steel, the nature and amount of drawing, and the heat-treatment given in process, or as a final operation.

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INCREASING the carbon, manganese, phosphorus and certain other alloying elements makes the wire stiffer, stronger and harder. However, the cold-work of drawing has a more drastic effect in increasing the temper than an increase of carbon or other alloying elements. The softness and ductility of the wire can be increased by annealing. Thus, without regard to chemical composition, the strength and hardness are regulated by the drawing and annealing operations; and low-carbon wire can be made to vary in a wide range of temper from hard to extra soft. The hard temper is obtained by drawing several successive times without annealing. A medium temper may be obtained by less reduction in section or only partial annealing. A single, light pass after annealing gives a bright, soft wire. A soft or extra soft wire may be had by annealing as the final operation.

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BY varying and correlating the above factors, it is possible to get a wider range of mechanical properties and finishes on wire than probably in any other steel product, and the fact the properties can be controlled over such a wide range has made wire adaptable to innumerable uses.

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Classification

THE Carbon Steel Wire Manual, following the conventional classifications that prevail in the trade, broadly classifies wire into two main divisions, namely, (1) Merchant Wire and Merchant Wire Products, and (2) Manufacturers Wire.

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MANUFACTURERS WIRE as its name implies, is wire which is generally sold to industry for manufacture into a wide variety of products.

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THE classification Merchant Wire and Merchant Wire Products includes such commodities as wire nails and staples; barbed wire; twisted fence stays; wire fence, including farm field fence, poultry fence, ornamental lawn fence and diamond mesh fence; annealed and galvanized fence wire; merchant wire; single-loop bale ties and single-loop bale-tie wire; and wire hoops.

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IN general, Merchant Wire and Merchant Wire Products are

not subject to specifications involving specified chemical or mechanical requirements.

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FROM a tonnage standpoint some of the largest items in the Merchant Wire and Merchant Wire Products classification are:

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Nails and Staples

WIRE nails were first made in the United States about 1851. In 1875 the manufacture of wire nails was started in Covington, Kentucky, on some machines imported from Germany, where the art of making wire nails was practiced, and this grew into the American Wire and Screw Nail Company. Wire nails won quick acceptance, and the growth of the industry was such that by 1886 an Association of Wire Nail Manufacturers had been formed and issued a wire nail card, and by 1890 the production of the old cut nails had practically ceased. Today approximately twenty per cent of all the steel wire produced is made into nails.

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NAIL manufacturers have been active in devising new types of nails, new heads and points to meet various nailing requirements, special coating to provide increased holding power, and special finishes for certain applications. There became such an enormous number of sizes and types of nails that an American Iron and Steel Institute Subcommittee on Simplification of Standards for Nails and Staples, Barbed Wire and Woven Wire Fence undertook an extensive study after which recommendations were made to the division of Simplified Practice of the Bureau of Standards as to the types and sizes of nails and staples that should be considered standard. Twenty nine types of nails and staples were proposed, with tables of standard sizes and size designation for each. After having been accepted by several hundred of the principal manufacturers, distributors, and users, the recommendations were approved and promulgated by the Department of Commerce in 1947 in Simplified Practice Recommendation R-223.

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Barbed Wire

A MACHINE for making two-point barbed wire was patented by Joseph F. Glidden in 1874, and six years later the four-point wire was developed. Due to the rapid development of the western ranges and farm lands about this time there was an enormous demand for barbed wire and the growth of the industry was rapid.

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IN barbed wire fence, two wires, usually galvanized but sometimes painted, known as line wires, are twisted together and at regular intervals the barbs are wound about one or both of the line wires.

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GENERALLY speaking, there are two types of barbed wire, the hog with barbs close together and the cattle with barbs further apart. The two-point barbs are formed of one wire and the four-point of two wires. There are three kinds of barbs, speaking from a standpoint of the cross-section, the flat, the half-round, and the full round. There are various methods of wrapping the barbs around the strand, that is, wrapping once around one wire and once around both; wrapping twice around one wire; wrapping around one wire once; or wrapping once around each cable.

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THE wire is marketed in 80 rod, or in catchweight spools.

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Woven Wire Fence

A VERY large tonnage of galvanized wire is fabricated into woven wire fencing. Woven wire fencing is manufactured in wide range of types which vary in style or design, and each type may be made up in many different sizes. In general all types resemble, in that they have several lateral or horizontal wires which are secured with vertical or diagonal stay wires, forming meshes of varying sizes depending on the intended use, the meshes being large for cattle, smaller for hog and still smaller for poultry. The horizontal wires contain tension curves which enable the fence to stretch better and allow for expansion and contraction due to temperature changes.

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AS in the case of nails and staples, an American Iron and Steel Institute Subcommittee has cooperated with the Division of Simplified Practice of the Bureau of Standards and agreed on a simplified list of types and sizes of woven wire fence that are recommended as standard in the industry. This list has been promulgated by the Department of Commerce as Simplified Practice Recommendation R 9-47.

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Bale Ties

BALE ties are manufactured in a complete range of sizes for baling hay, straw, excelsior, rags, paper, etc. They are made from wire specially produced to meet specific requirements of strength and still have enough ductility to withstand the twisting necessary in forming the fastening loops. There are two grades of bale tie, the Single Loop, having a tensile strength of 65,000 lbs. per sq. in. minimum and Cross Head, having a tensile strength of 140,000 lbs. per sq. in. minimum. Both types vary in gauge from 12 to 16½ and are generally furnished as strand annealed wire with a light oxide finish.

★ ★ ★

Wire Hoops

THERE are two styles of wire hoop, the twisted splice, and electric welded. The twisted style of hoop is used principally for slack cooperage and to a small extent as reinforcement in cylindrical concrete work. This style of hoop is objectionable for smooth finished woodenware packages, because the twisted splice mars the package slightly in driving the hoop in place. The electric welded style of hoop is used on finely finished woodenware packages, also as reinforcement in cylindrical concrete work. This style of hoop can be

(*Please turn to page* 188)

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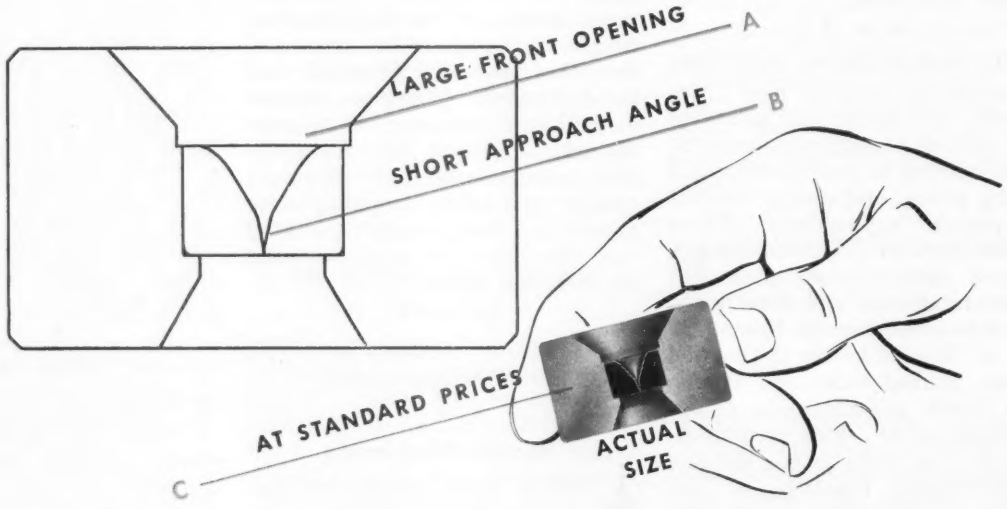

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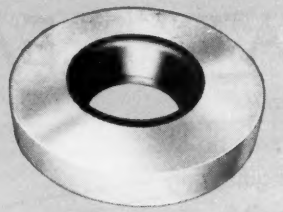

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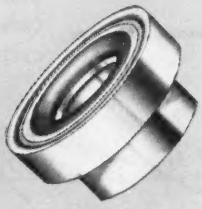
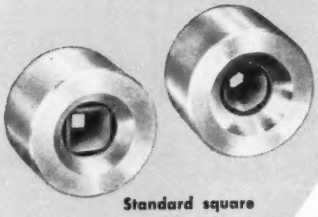
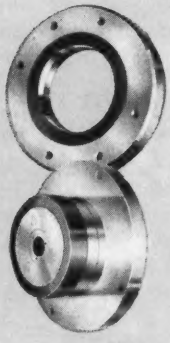


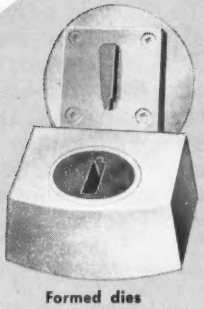
Special round-hole dies



Standard square and hex dies



Round blanking and punching dies



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Dept. of Materials Engineering
Syracuse University
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Part II.

TO summarize, T-T-T curves give an indication of the necessary critical cooling rate to obtain martensite; the temperature at which martensite starts to form, Ms, the length of time for the start and the finish of the transformation of unstable austenite at each temperature; the micro-structure and properties of the steel, obtainable. The use of available transformation curves permits shortening of heat treating time cycles and makes it possible to predetermine the properties which may be obtained. Residual stresses and distortion are minimized, predictable microstructures are realized, definite time cycles for production work can be

Part I was printed in the January, 1949 issue and Part III will be printed in the March, 1949 issue of Wire and Wire Products.

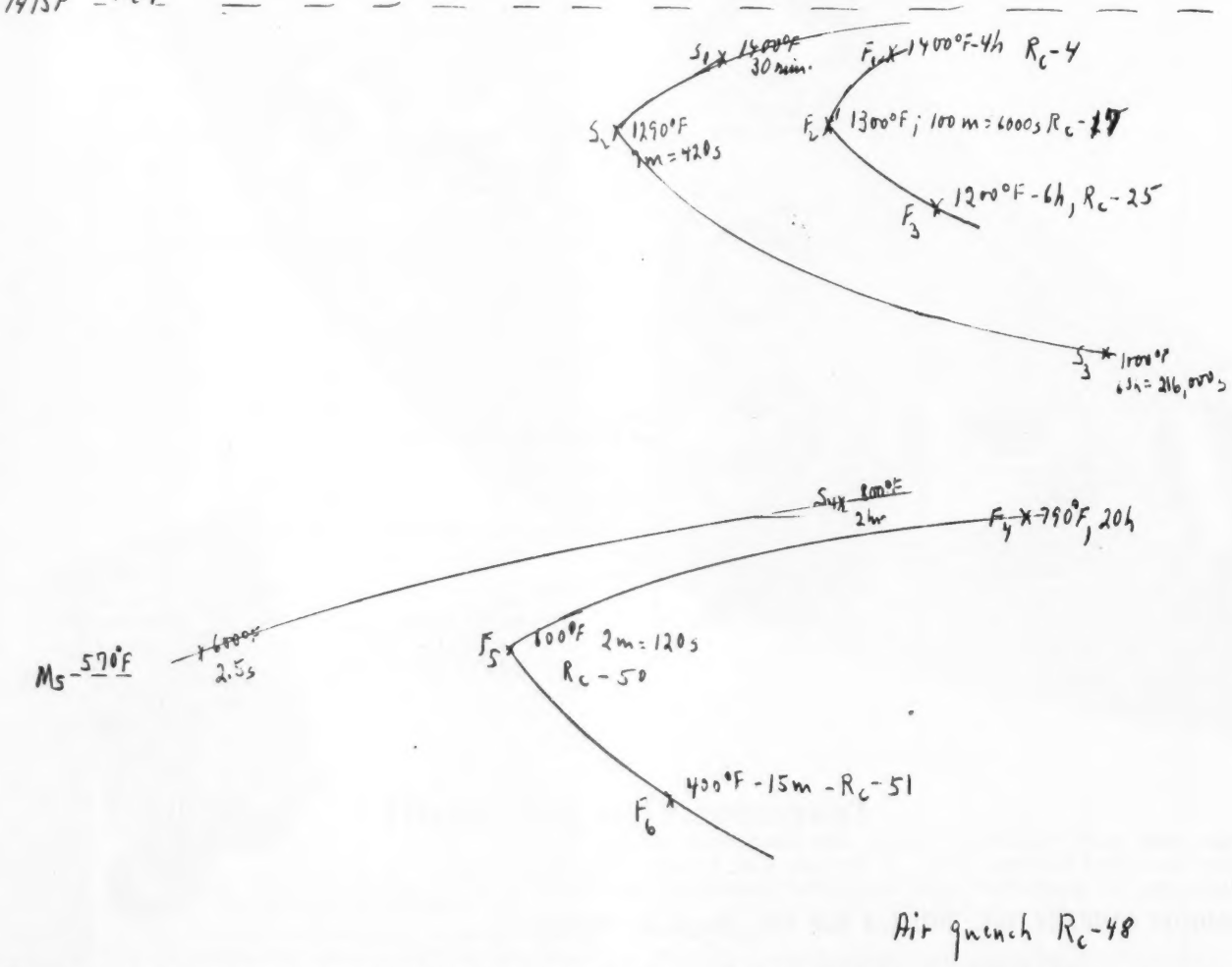
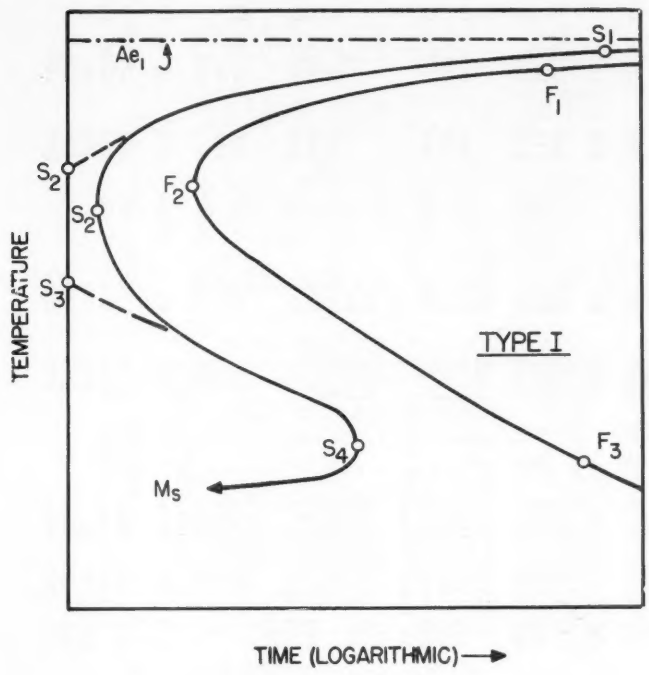


Figure 7. Example of using work sheet (Fig. 6) and Table IV, Steel 53 0.55% C, 3190% CR, 0.45% Mo, 0.90% V. Austenitizing Temperature 1650°F.

Fig1. REPRESENTATIVE CURVES FOR TYPE I ALLOYS



established with a minimum of preliminary experimental work, and the number of operations in a process may be reduced. The T-T-T curves are not only useful for isothermal treatments, but when used judiciously may be applied to conventional heat treatments as well. The I-T curves may suggest alternative steels for a given use. Thus, both metallurgical and processing advantages can be secured by using T-T-T curves.

* * *

CAUTION must be observed, however, since such curves are obtained under special research conditions. In practice some experimentation is necessary to determine if a part can be treated to desired hardness by following the I-T curve for the steel. Just as in direct quenching, the size of the part has a definite effect on the result of isothermal treatments.

★ ★ ★

SUITING the Heat Treatment to the Job, (61) is the title of a recent publication which explains in more detail the heat treatment of steel and the properties which may be obtained.

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T-T-T Curve Index

AN attempt is made here to compile in one place the various curves which have been determined for a variety of analyses. In this compilation no attempt has been made to evaluate the validity of the results of the various workers. Different types of curves for the same type of steel may be noted. Such differences may be the result of varying experimental techniques in determining the curves, exact chemical composition of the steel and other less obvious factors. To reproduce the curves as such would be impractical. From the data included here it is possible for one to draw the beginning and end of the transformation curve, data of practical importance which must be used by the heat treater to determine the length of time he has available at a given temperature. Reference is given to the original paper to permit consulting it for details. Hardness data is given when available, since in the heat treat shop the treatment often depends only on the specified hardness.

★ ★ ★

THE heat treater must realize that the curves he can draw from the data in the following four tables are for isothermal quenching—that is to say—quenching to a definite and constant temperature above the temperature of the usual oil, water or brine quench. The Ms is below room temperature for some steels. The transformation which results during continuous cooling must be taken into consideration.

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OVER 400 analyses have been collected in an Index Table A. The steels are arranged consecutively according to increasing percentages of one or more of the alloying elements present. The A. I. S. I. or SAE numbers are also listed. In this table the source of the data is given by a reference. The last two columns indicate the type of curve to which the steel may be assigned and the consecutive number on the Type Tables (I-IV).

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EACH Type Table (Tables I to IV) has a sketch, which gives an outline of each type of curve (Fig 1-4) in which the corresponding T-T-T diagrams may be fitted. This classification has been arrived at only on the basis of the physical appearance of the **start** (points S_1 S_2, S_3 . . . .) of the austenite transformation curve and end or **"finish"** (F_1, F_2 . . .) of the transformation. These points are the intersection of lines crossing at right angles (or 90°) of the given temperature in °F. and the time lines. For the convenience of the user of this data a semi-logarithmic coordinate paper suitable for drawing his own curves is printed (Fig. 6). By superimposing a sheet of transparent paper any curve from the Index may be located on this sheet by indicating the proper temperatures and time intersection points (Fig. 7)* and drawing a smooth curve through the S_1, S_2 . .

* **Fig. 7 is given in actual size. Fig. 8 is another example, but reduced in size on printing.**

TABLE I. TYPE I ALLOYS.

ITEM	AUSTENITIZED AT °F	GRAIN SIZE	A_{e3}	A_{e1} if x A_{c1}	S_1 °F	S_1 TIME	S_2 °F	S_2 TIME	S_3 °F	S_3 TIME	S_4 °F	S_4 TIME	M_s °F	F_1 °F	F_1 TIME	F_1 HARD.	F_2 °F	F_2 TIME	F_2 HARD	F_3 °F	F_3 TIME	F_3 HARD.	HARDNESS	NO.
1	1700				1490	1 s								1230	10^5s	V-177	1200	20s	V-155	900	1.s	V-189		1
2	1600		1500	x1350	1300	6 s	1100	1.s	980	0.8s			880	1200	7s		1100	3s		900	1.5s			2
3x	1660	7-8		1340	1340	10s	1235	1s					550	1300	10^5s	C-2	990	3s	C-20	520	10^3s	C-42	C-50	3
4xx	1660				1320	10s	1140	1s					650	1255	10^3s	C-4	1030	2.5s	C-17	550	10^2s	C-40	C-50	4
5	1550	mixed	1475	1330	1465	50s	1330	0.5s	810	0.5s	720	0.8s	665	1280	10^4s	C-9	1080	3s	C-25	645	10^2s	C-45	C-52	5
6	1700				1350	10s	1215	1s	780	1s	630	2.5s	500	1250	10^3s	V-194	1060	4.2s	V-262	500	10^3s	V-566		6
7	1425			x1365	1365	60m	1240	1s						1300	60m	C-3	1200	8s	C-14	1110	3s	C-21		7
8	1370		1350		1330	60h	1250	15s						1315	60h		1250	2m						8
9	1670	7-8	1405	1340	1370	10^3s	970	0.6s			660	12s	580	1270	10^3s		1010	4s	C-28	510	10^3s	C-52	C-62	9
10	1670	7-8	1390	1340	1370	10^2s	1060	0.5s	980	0.5s	685	6s	610	1300	10^2s		1050	1.5s	C-27	505	10^3s	C-50		10
11					1300	10^2s	1060	1s	640	100s	This curve for 50% transformation only													11
12			1350		1300	10^2s	1110	0.5s	780	0.5s	430	1.7s	250	1340	10^4s		1050	1s		500	10^3s			12
13					1270	10s	1100	2s	920	2s	480	1m	400	1300	4m	C-16	1000	3s	C-33	500	10^3s	C-50+		13
14	1600	6-9	1360	1330	1345	10^3s	1150	0.5s	850	0.5s	565	25s	520	1280	10^3s	C-23	1090	3s	C-34	600	10^3s	C-53	C-65	14
15	1500	5-6	1355	1320	1350	10^3s	1120	0.5s	975	0.5s	538	40s	525	1270	10^3s	C-15	1100	6s	C-33	580	10^3s	C-52	C-65	15
	2000	2											525											
16	1500	5-6	1360	1325	1335	10^3s	1080	1.5s			530	1m	520	1290	10^3s	C-19	1120	9s	C-33	600	10^3s	C-50	C-65	16
17				1340	1340	10^5s	1020	0.9s			460	500s		1315	10^5s	C-5	1060	6s	C-41	315	10^6s	C-62		17
18	1650	6		1340	1310	10^4s	1020	0.9s			530	100s	445	1290	10^4s	C-11	1050	5s	C-39	470	10^4s	C-56		18
19	1385			1370	1350	60m	1115	2s						1330	1h	C-8	1150	8s						19
20	1625	4-5		1340	1330	10^4s	1050	0.8s			500	250s	420	1310	10^4s	C-15	1040	4s	C-41	460	10^4s	C-57		20
21	1830	5-6			1317	11m	1250	1s	932	1s	471	5m	468	1315	50m		1015	1s		580	10m			21
22	2000	2-3			1290	10^3s	1050	8.5s			520	10^3s	Curve for 50% Transformation											22
23				1330	1225	20s	1000	2.5s			650	100s		1220	100s		1100	20s		640	10^3s			23
24	1670	7-8		1340	1580	100s	1200	0.5s	860	0.5s	380	1h	300	1290	100s	C-27	1040	2s	C-45	615	10^3s	C-55	C-65	24
25	1450			x1360	1360	1h	1150	1.5s	945	1.5s	400	15m	385	1325	1h	C-18	1050	3s	C-42	440	1h	C-60	C-66-B	25
26	1410			1370	1355	1h	1150	3s						1345	1h	C-8	1150	20s						26
27				1355	1300	15s	1000	1.5s			420	2h	100	1300	100s	C-35	1100	5s	C-47	280	10d	C-63		27
28				1350	1335	10^3s	1000	1.5s			400	66m	325	1300	10^4s		1100	5s		500	10^4s			28
29	1670	7	1370	1330	1320	10^3s	960	0.7s			555	90s	490	1255	10^3s		1000	20s	C-35	590	10^3s	C-50		29
30					1300	10^4s	1000	8s			700	100s	50% Transformation Curve											30
31	1600		1580	x1370	1450	100s	1300	7s	1000	2s			750	1320	100s		1000	4s						31
32	1600		1580	x1350	1410	100s	1300	10s	1000	3s			720	1300	100s		1000	5s						32
33				1350	1250	10^3s	1000	2.5s			550	100s		1275	10^4s		1025	30s		630	10^3s			33
34	2010	3-4	1425	1300	1290	10s	1020	2.5s			660	7s	660	1170	100s		975	30s		680	100s			34
35	1550	7-8 2-7			1350	10^4s	950	1.4s			680	3s	500 640	1180	10^4s	C-6	880	75s	C-26	540	10^3s	C-47	C-59,B	35
36	1650		1380	1320	1290	30s	930	3s			660	10s		1280	10^7s		930	1m	V-275	660	400s	V-440		36
37	1650	8-9			1400	10^5s	980	3s			700	5m		1000	10^3s		980	100s		790	5m			37
38	1650		1365	1300	1300	100s	980	6s			580	100s		1290	10^7s		840	500s	V-320	570	83m			38
39					1190	10^5s	950	7s			600	250s	50% Transformation Curve											39
40	1550	2+7	1430	1345	1410	100s	1200	0.5s	800	0.5s	610	3s	575	1270	100s	C-17	1000	4s	C-28	495	10^3s	C-53	C-62	40
41	1600	3+7	1495	1380	1480	100s	1190	0.5s	900	0.5s	600	6s	580	1100	100s	C-20	1120	10s	C-30	600	500s	C-52	C-63	41
42	1600				1200	7s	1050	2s			750	17s		1200	30s	C-32	1100	27s	C-36	750	250s	C-37	C-60.0	42
43	1525				1000	2.9m	800	0.7m			500	2.5m	400	1000	3h		800	18m		400	8h			43
44	1525				1000	2.m	800	0.7m			500	3m	400	1000	200m		800	18m		400	17h			44
45	1600				1275	40s	960	8s			620	30s	440	1280	800s		970	200s		600	10^3s			45

TABLE I. (Continued)

ITEM	AUSTENITIZED AT °F	GRAIN SIZE	A_{e-3}	A_{e1} if x A_{c1}	S_1 °F	S_1 TIME	S_2 °F	S_2 TIME	S_3 °F	S_3 TIME	S_4 °F	S_4 TIME	M_s °F	F_1 °F	F_1 TIME	F_1 HARD.	F_2 °F	F_2 TIME	F_2 HARD.	F_3 °F	F_3 TIME	F_3 HARD.	HARD-NESS	NO.
46														50% Transformation Curve										46
47	1480	8-10	1370	1315	1280	10^3s	960	0.6s			600	40s												47
48	1480	8-10	1340	1280	1360	10^3s	1110	0.5s	835	0.5s	615	12s	550	1250	10^3s	C-4	970	1.6s	C-28	550	10^3s	C-50	C-65	48
49	1450	7-8	1350	1225	1310	10^3s	1050	0.5s	850	0.5s	590	15s	540	1220	10^3s	C-11	1000	2.5s	C-20	580	10^4s	C-51	C-64	49
50	1480	8-10	1310	1190	1320	10^4s	900	0.8_2			590	19s	580	1150	10^4s	C-11	915	1m	C-24	450	10^4s	C-50	C-60.B	50
					1280	10^3s	930	1.5s			580	250s	500	1140	10^3s	C-14	990	25s	C-25	650	10^3s	C-45	C-64	
51	1450		1405	1120	1170	1h	1110	1s					670	900	15h	C-14	750	8m	C-26	500	$5x10^3$s	C-42	C-44	51
52	1700				1500	10s	1350	1s						1210	10^3s	V-158	800	1s	V-220					52
53	1700				1500	6s	1320	1s						1250	10^5s	V-170	1060	10^3s	V-179	810	$1s_3$	V-240		53
54	1550				1360	20s	1120	1s	900	1s	650	3s	500	1240	10^5s	V-181	970	9s	V-265	500	10^3s	V-566		54
55	1600	6-8½	1370	1330	1340	10^3s	980	0.8s			580	1m	540	1270	10^3s	C-22	1000	9s	C-36	600	10^3s	C-54		55
56	1550	8		1350	1295	10^3s	1050	1s			480	5m	400	1280	10^3s	V-209	1080	4.5s	V-390	480	1h	V-689		56
57	1550	8		1355	1290	10^3s	980	3s			480	200m	400	1275	10^3s	V-260	1040	9s	V-376	450	10^4s	V-710		57
58	1700+	8		1350	1400	50s	1165	1s	1000	1s	305	8h	245	1300	500s	V-254	1050	4.5s	V-502	415	10^5s	V-800		58
59	1700+	8			1400	1m	1050	2s			300	5.5h	240	1290	10^3s	V-260	1050	11s	V-487	410	10^5s	V-818		59
60	1600	8-9	1420	1340	1300	2m	1000	4s					710	800	500s		800	100s		650	30s			60
61		7-8			1290	80s	960	4s			750	8s	700	1290	10^3s		1200	550s	C-19	1110	1h	C-26	C-57.0	61
62		7-8			1290	7s	1170	4s			740	4s	710	1200	5.10^4s	C-12	1100	$2.7.10^3$s	C-20	970	7.10^3s	C-25	C-53	62
63	1500				1350	10m	1120	2.5s			400	15m	300	1340	1h	C-18	1150	25s	C-36	405	2.5h	C-62		63
64	1500			x1385	1360	1h	1130	1.5s	1020	1.5s	400	4m	400	1350	4h	C-18	1120	12s	C-36	300	8h	C-64		64
65	2190	2-3	1470	1430	1450	10^6s	1270	100s			980	10^4s	700	1380	10^5s		1270	250s		990	10^6s			65
66	1450			1345	1310	10m	1000	1.7s			420	5m	420	1300	1.5h	C-15	1000	40m	C-35	500	80m	C-57+	C-63.0	66
67	1500+	11		1335	1305	100s	1100	0.5s	1000	0.5s	475	300s	420	1280	100s	C-8	1050	3s	C-38	600	10^3s	C-50+		67
68	1450			x1370	1350	1h	1095	9s			605	1m	390	1340	6h	C-14	710	15m	C-44	400	5h	C-60	C-65.0	68
69	1425				1340	4h	1175	15s						1300	8h	C-17	1220	30m	C-25					69
70				x1380	1330	1h	1050	1.6s			400	12s	340	1300	1h	C-22	1100	8s	C-42	350	15h	C-63	C-67.B	70
71		7-8			1290	15s	1110	5s			750	4s	660	1270	10^4s	C-13	1170	20m	C-27	1100	35m	C-34	C-60	71
72					860	10^4s	850	200s			700	1m												72
73	2010	4-5	1650	1290	1290	5s	1065	1.5s			660	2.5s	660	1250	100s		1060	10s		660	50s			73
74	As Rcdx				1100	5s	1000	4s	680	20s	600	4s		1100	10h		820	1m		600	1h			74
75	1600x				1100	5.5s	1000	4 5s	700	50s	600	4s		1100	20h		820	10m		600	1h			75
76	1800x				1100	7s	1000	6s	700	40s	600	4s		1060	10^5s		800	10m		600	1h			76
77	2000x				1100	8s	1000	7s	700		600	4s		1100	10h		810	10m		600	$1\frac{1}{2}$h			77
78	1800x				1100	8s	1000	6s	700	30s	600	6s		1100	10^4s		800	10m		600				78
79	2000x				1100	10s	980	7s	750	10s	600	6s		1050	10^5s		850	10m		600	20m			79
80	1750										572	1.2m	440				572	21m		400				80
81	1750										572	6m	320				572	1h		400				81
82	1750										572	1.5h	170				572	6h		380	100h			82
83	1750										572	2.h	140				572	9h		500	100h			83
84	1750										572	12m	214				572	1h		400	40h			84
85	1490				1030	1h	900	15s	825	1m			725	1030	10h		980	1h		800	10^5s			85

x Probably too low to dissolve carbides

\+ Homogenization treatment at.... Austenitizing temperature 1660F

TABLE II TYPE II ALLOYS

ITEM NO.	AUSTENITIZED AT °F	GRAIN SIZE	A_{e3}	A_{e1} if $^{x}A_{c1}$	S_1 °F	S_1 TIME	S_2 °F	S_2 TIME	S_3 °F	S_3 TIME	S_4 °F	S_4 TIME	Ms °F	F_1 °F	F_1 TIME	HARD
1	1600			x1345	1430	60s	1200	1s						1230	2h	
2	1425			x1345	1300	10m	1100	1s					400	1140	2h	
3	2460	1-2			1250	2s	1110	0.4s	750	1s			750	1200	10^4s	
4	1550	7+2	1430	1295	1405	10^4s	1000	0.8s	680	4s			500	1220	10^4s	C-8
5	1650			x1335	1400	8h	1100	3.5s	600	20s			580	1200	15m	C-7
6	2370				1290	5h	930	7s	750	2m				1160	50m	
7	1450				1300	10^4s	1050	6s	500	10^3s			300	1270	10^4s	C-10
8	1900	7			1290	5h	800	15s	570	3m			500	1130	5h	
9	2370	0-1			1250	10^5s	730	25s	550	2m			500	1130	5h	
10	1830	5-6			1310	10^4s	1070	100s	660	5h	570	10^5s	70	1200	10^5s	
11	2370	0			1350	10^4s	1100	5m	750	12h	570	10^5s	70	1200	10^5s	
12	1800	3+7		1430	1540	10s	1120	1s	645	8s			580	1360	100s	
13	1550	6-8	1380	1175	1300	30m	1000	3.5s	650	9s			650	1100	50m	C-7
14	1740	6			1220	10^5s	840	10s	600	90s	400	1s		1150	10^5s	
15	2010	3-4	1340	1220	1240	100s	990	5s	640	100s			500	1130	10^3s	
16	1550	8-9		1320	1250	20s	970	2s	615	11s			575	1270	10^3s	C-15
17	1600			x1300	1350	1m$_5$	1050	1.4s	850	2.4s	700	1s		1200	20m	C-7
18	1650	4-8	1465	1290	1465	10^5s	1120	1.2s					610	1270	10^5s	C-5
19	1550	7-8	1390	1305	1370	10^4s	1050	1.2s	670	8s			630	1265	10^4s	
20	1550	7-8			1100	5s	1000	2 5s	900	4s						
21	1650	6-6.5			1100	8s	975	3.5s	900	5.5s						
22	1700	5-6			1100	8.2s	960	4.6s	900	6.1s						
23	1800	3.5-4			1100	9s	975	6s	900	7s						
24	1550			x1310	1375	1h	1050	1.4s	660	7s			590	1200	3m	C-13
25	1450				1300	1.5m	900	5s						1215	15h	C-7
26	1550	7	1350	1310	1350	10^4s	940	14s	705	150s			445	1230	10^5s	
27	2010	5	1400	1320	1350	100s	970	4s	660	22s			610	1250	200s	
28	1700				1500	6s	1320	1s						1320	10^5s	V-170
29	1700				1500	7s	1270	1s						1370	10^5s	V-165
30	1650	8-9	1495	1330	1480	50s	1015	0.5s						1280	10^5s	
31	2500	1-2	1495	1325	1480	50s	980	0.5s						1270	10^5s	
32	1560	7-8			1300	5.10^3s	1180	100s	1100	5m	900	7s		1200	$3x10^4$s	
33	1560	7-8			1300	100s	1200	50s	1150	50s	1000	6s		1240	1.4h	
34	1560	9			1300	100s	1220	6s	1150	2m	900	5s		1260	3.10^4s	
35	1525			x1350	1290	5h	1290	2m	1170	1s			600	1100	3h	C-7
36	1600	6-7	1460	1340	1440	100s	900	0.8s	690	2s			515	1300	10^5s	
37	1600	6-7	1470	1330	1430	100s	880	0.7s	660	2s			630	1330	10^4s	C-3
38	1600	5-6	1440	1330	1420	100s	900	0.6s	635	2s			540	1275	10^3s	
39	1550	7-8		1315	1320	10^4s	950	4s	625	45s			500	1235	10^5s	C-21
40	1560	10			1300	2m	1125	130s	950	7s	800	15s		1240	2.10^4s	
41	1550				1350	13.5s	960	1.2s	710	4s			510	1260	10^5s	V-177
42	1500				1360	8m$_4$	1180	1s	680	1s	600	8s	600	1300	9h$_4$	C-9
43	1500	6-7	1405	1310	1375	10^4s	970	12s					550	1250	10^4s	
44	1560	8-9			1300	2000s	1120	2m	1050	200s	920	10s		1230	5000s	
45	1560	7-8			1300	3.10^4s	1170	3.10^3s	1040	2.10^4s	880	20s		1200	2.10^4s	
46	1650	7-8	1370	1330	1350	10^4s	920	2.5s	500	80s			460	1265	10^4s	
47	1560	7-8			1300	104s	1000	6s	820	10s				1300	10^4s	
48	1560	8-9			1300	10^4s	1170	500s	1090	10^3s	870	20s		1300	4.10^4s	
49	1550+	7-8		1330	1400	10^3s	900	5s	380	50m			330	1300	14h	C-15
50	1750	5-6		1330	1370	500s	915	6s	330	4h			305	1315	10^5s	C-19
51	1700+	8		1357	1390	1m	1100	4s	300	5.5h			245	1300	1h	V-267
52					1300	10s	920	2s	710	3.5s			550	1300	10^4s	C-(-4)
53	1550	9-10	1470	1360	1460	10^3s	1000	1.3s	700	6s			650	1320	10^3s	C-12
54	1660				1410	70s	950	2.1s	735	3s			560	1335	10^5s	C-6
55	1660				1400	40s	920	2s	720	3s			640	1320	10^4s	C-8
56	1550	7-8	1445	1365	1430	10^4s	880	3s	700	6s			640	1310	10^4s	C-10
57	2000	2-3	1445	1365	1405	10^4s	920	2.5s	705	6s			510	1310	10^4s	C-8
58		8			1410	10^3s	920	2.5s	720	5s			530	1300	10^4s	
59	1550			x1350	1325	1h	1200	44s	1100	2m	890	3s	625	1300	1h	C-10
60					1300	45s	1040	1s	740	1s	680	1 3s	620	1220	14h	
61	1650			x1330	1330	6m	1030	1s						1200	4h	
62	1550	8			1300	800s	925	2s	640	22s			550	1200	11h	
63	1550	7-8	1390	1280	1370	10^5s	920	1.8s	700	4s			640	1250	10^5s	C-3
64		8			1360	10^4s	950	1.3s	720	2 5s			540	1260	10^5s	
65	1450				1300	2m	900	3s								
66	1650	8-9	1425	1230	1400	10^6s	1110	0.5s					750	1170	10^6s	
67	1560				975	7h	805	40s	660	70s			580	845	17h	
68	1600	5-6	1455	1380	1430	10s	925	0.6s	660	2s			510	1320	10^3s	C-6
69	1600	6-7	1470	1415	1450	200s	955	2s	705	7s			570	1390	10^3s	
70	1550+	6-7	1425	1360	1410	10^4s	1000	1 8s	670	5s			630	1320	10^4s	C-13

F_2			F_3			F_4			F_5			F_6				
°F	TIME	HARD.	°F	TIME	HARD.	°F	TIME	HARD.	°F	TIME	HARD.	°F	TIME	HARD.	HARDNESS	NO.
1200	1h	"B" 84	1100	3h	"B" 85	900	15s	C-20	800	30s	C-32	700	13s	C-36		1
900	45s		600	3h		450	20m		(sample carburized)							2
1130	1.5h		1090	10^4s		1010	10^4s		880	50s		790	1m			3
1100	5m	C-15	905	20m	C-21				770	150s	C-35	470	10^4s	C-48		4
1090	8m	C-20	950	55m	C-22				800	4m	C-29	420	4h	C-50	C-57	5
1110	5m		1000	5m		930	3m		750	10m						6
1080	1m	C-27	810	35m	C-38				700	10^3s	C-42	470	10h	C-54		7
1000	45m		890	2h		800	1h		710	25m		570	1h			8
1000	2h		930	10^4s		800	10^4s		700	30m		500	10^4s			9
1040	5h		920	10^5s												10
1050	4h		910	10^5s												11
1200	13s	C-35	800	100m	C-38				800	10^3s	C-51	400	14h	C-55	C-62	12
1050	25m		1000	1½h	C-14				840	40s	C-25	700	110s	C-37	C-51,W	13
1060	10^4s	V-240	930	5.10^4s	V-255				750	10m	V-335	480	10^4s	V-530	V-740,W	14
1030	80s		990	200s					880	100s		680	10^3s			15
1190	2m	C-26	910	8.3h	C-25				750	10^3s	C-36	590	5.5h	C-46		16
1100	10m	C-10	1000	75m	C-14				700	80s	C-25				B-311,O	17
1150	40s	C-5	960	10^4s	C-8				870	12s	C-19	720	20s		C-45,W	18
1120	55s	C-20	1000	350s	C-21				895	110s	C-26	560	10^3s	C-49	C-60,B	19
																20
																21
																22
																23
1100	1m	C-20	1000	5m	C-21				880	150s	C-28	500	1h	C-49		24
1000	1h	C-21	900	2.5m												25
1105	3h	C-38	1070	10^5s		870	10^5s	C-51	800	500s	C-39	560	18m	C-45	C-57,W	26
1150	35s		1040	200s		980	50s		660	5m						27
1200	5.5h	V-175	1090	8.3h	V-195	800	1s	V-250								28
1250	8.3h	V-166	1090	10^5s	V-219	1030	10^5s	V-215	840	1s	V-270					29
1200	1h	C-8	1080	1d	C-15	910	30m	C-25							C-48	30
1200	5h	C-8	1140	10^5s	C-13	1025	10^5s	C-20	910	1m	C-27				C-48	31
1150	1.5h		1110	10^4s		960	100s		880	1m		700	200s			32
1200	1.1h		1160	1.4h					950	80s		800	100s			33
1200	6.10^4s		1100	10^5s		1000	400s		900	100s		800	3m			34
1090	33m	C-16	1000	1h	C-23	700	30s	C-32	600	5m	C-48					35
1200	83m	C-16	1045	16.6h	C-22	840	1m	C-35	520	10^3s	C-51				C-60	36
1240	50m	C-12	1100	1.3d	C-19	895	18s	C-26	680	100s	C-45				C-59	37
1200	220s	C-9	1120	100s	C-15				940	14s	C-25	610	100s	C-49	C-60	38
1125	50m	C-24	890	90s	C-30				600	103s	C-51					39
1200	9.10^3s		1100	10^5s		1000	400s		900	1m		800	90s			40
1200	10^3s	V-198	1100	6h					925	12s	V-288	500	10^3s	V-540		41
1200	30m	C-13	1025	20h	C-22	680	4m	C-32	500	9m	C-52	170	1m	C-57		42
1180	30m	C-13	1070	8h	C-18				900	1m	C-29	595	10^3s	C-50	C-63	43
1200	4000s		1100	7.10^3s		970	100s		900	1m		700	500s			44
1170	10^4s		1050	10^5s		880	200s		800	4m						45
1200	50m	C-21	1050	10^4s	C-28				870	110s	C-34	480	10^4s	C-56	C-66	46
1140	10^3s		1100	10^3s		1080	50s		1000	20s		750	100s			47
1200	50m		1100	10^4s		950	400s		830	200s		670	10^3s			48
1170	20m	C-30	975	10h	C-35				800	23m	C-43	380	10^5s	C-63	C-66	49
1200	83m	C-31	1100	10^5s	C-35	770	10^5s	C-43	680	1h	C-50	455	10^5s	C-60	C-65	50
1200	200s	V-353	1100	150s	V-435											
1220	500s	C-5	1000	10^4s	C-16				950	45s	V-463	415	10^5s	V-820		51
1250	3m	C-15	1000	4h	C-24				850	40s	C-25	600	100s	C-47		52
1250	7m	C-10	1040	7.2h	C-21				790	90s	C-37	585	10^3s	C-44	C-56	53
1240	6m	C-13	1070	8.3h	C-20				800	50s	C-36	500	10^3s	C-47	C-52	54
									780	40s	C-36	520	10^3s	C-46	C-52	55
1220	400s	C-20	1000	5.5h	C-29				700	210s	C-44	450	10^4s	C-52	C-61,B	56
1210	10^3s	C-26	1000	10h	C-29				705	210s	C-45	500	30m	C-50+		57
1225	400s	C-20	990	5.5h	C-29				800	105s	C-37	480	30m	C-51		58
1200	6m	C-20	1000	6h	C-29				700	4m	C-44	425	3h	C-52		59
1150	117m	C-4	1060	14h	C-17	1010	14h	C-30	850	28s	C-30	400	11h			60
1150	2h	C-4	1030	14h	C-29				840	30s	C-30	650	1m	C-41		61
1125	100m	C-10	1030	11h	C-11	1000	11h	C-18	860	80s	C-26	500	200s	C-46		62
1130	30m	C-9	1025	10^5s	C-14	970	105s	C-14	760	200s	C-37	400	14h	C-51	C-60,B	63
1160	4h	C-4	1075	4.7h	C-12				900	32s	C-23	510	30m	C-48		64
1260	29h		1050	3.5h	C-21				900	2.5m						65
1100	1.4d	C-4	1040	3d	C-7	900	10^3s	C-15	800	70s	C-30	600	5m	C-40	C-46	66
720	33m		390	10^3s												67
1140	25s	C-20	1000	90s	C-20				870	30s	C-30	500	10^3s	C-49	C-60	68
1280	250s	C-14	1025	10^5s	C-27	860	10^5s	C-33	645	300s	C-46	500	10^4s	C-48		69
1200	40s	C-24	1000	800s	C-26				830	110s	C-35	530	10^3s	C-51	C-62,B	70

TABLE II. TYPE II ALLOYS (Continued)

ITEM NO.	AUSTENITIZED AT °F	GRAIN SIZE	A_{e3}	A_{e1} if $^{x}A_{c1}$	S_1 °F	S_1 TIME	S_2 °F	S_2 TIME	S_3 °F	S_3 TIME	S_4 °F	S_4 TIME	Ms °F	F_1 °F	F_1 TIME	HARD.
71	1400				1385	1h	1150	1.5s						1335	1h	C-13
72	1550	9		1345	1345	100s	1050	3s	530	50s			460	1310	10^3s	C-18
	1950	3											290			
73	1525			x1360	1410	1h	870	15s	600	1m			540	1280	1h	
74	2190	2	1420	1365	1400	10^3s	1100	4s	1100	4s			640	1300	10^3s	
75	1740	6			1470	7m	1330	50s	1070	10^4s	910	1s		1380	30m	V-140
76	2460			1460	1430	10s	1330	8s	1200	9s	1050	1.5s	950	1400	1h	"B"-71
77	2010	3-4	1470	1380	1400	10^3s	1300	150s	1130	50m	885	5s	680	1340	10^4s	
78	1550	8	1440	1370	1420	10^4s	940	2s	650	10s			620	1315	10^4s	C-13
79	1450				1400	15m	1175	10s						1300	6m	C-12
80	1550	9		1370	1370	10^3s	900	3s	590	35s			550	1280	100s	C-20
81	1650	9-10	1530	1340	1520	10h	1360	0.5s						1300	10^5s	C-4
82		7-8			1160	10s	950	3.5s	800	6s				1175	200s	V-227
83	1600	9-10	1450	1340	1280	20s	1010	5s	900	4s	750	6s	690	910	500s	
84	1550	9-10	1430	1320	1360	10s	1000	1.8s	690	5s			585	1300	10^5s	C-0
85	1500			x1355	1350	8h	1125	16s						1300	8h	C-11
86	1650	7-8	1540	1340	1510	10^4s	1350	0.5s						1300	10^5s	C-7
87	1575	10-11	1480	1280	1400	500s	1000	1 2s	675	5s			620	1270	10^4s	
88	1525	9-10	1425	1350	1360	50s	1000	1s	590	8s			560	1300	10^4s	C-7
89	1525	9	1400	1350	1345	100s	1000	2s	575	30s			555	1275	10^3s	C-15
90					800	10^4s	800	200s	600	80s						
91					930	10^4s	900	100s	700	20s	630	10s				
92					810	10^4s	770	500s	600	3m						
93					1300	700s	950	20s	700	40s			540	1180	11h	
94	As rcd x				1100	4s	1000	3s	820	6s	630	1s		1100	10^3s	
95	1600x				1100	4s	1000	1s	820	7s	640	1s		1100	10^3s	
96	1800x				1100	3s	1000	0.7s	800	7s	600	1s		1100	10^3s	
97	2000x				1100	4s	1000	0.9s	800	6s	600	1s		1100	10^3s	
98	As rcd x				1100	5s	1000	4s	800	9s	600	1s		1100	1h	
99	1600x				1100	5s	1020	0.9s	800	9s	600	1s		1100	800s	
100	1800x				1100	5s	1000	4s	700	7s	600	1s		1100	10^3s	
101	2000x				1100	6s	900	5s	700	7s	600	1s		1100	1½h	
102	1520				1200	200s	930	80s	840	200s	700	70s	347	1150	500s	
103	1550	8		+1364	1400	15s	950	2s	650	19s	600	16s	578	1360	1d	
104	1650		1535	+1410	1380	20m	1065	15h	750	10s	570	50s	465	1380	6h	
105	1650	7	1440	x1355	1405	10^3s	1050	3.5s	660	20s				1300	10^3s	

x Homogenization treatment at .... Austenitizing Temperature 1660 F

+ Probably too low to dissolve all carbides

points and F_1, F_2 . . .points. These curves may resemble the representative curve for each type. These sheets, if it is desired to save them for reference, should also include the hardness data when given in the table next to the F points.

★ ★ ★

THE first column in Tables I to IV lists the consecutive steels in each group. The next columns indicate the austenitizing temperature used, the grain size where determined and the critical temperatures. The columns that follow give the data for plotting point S_1, S_2 . . . namely the temperature and the time. These permit one to draw the beginning or "start" of the austenite transformation curve. The Ms points are listed in a separate column. To draw the "finish" of the transformation curve, again temperatures and times are given. In addition, the hardness (ard) attained on holding it a certain temperature until the transformation is finished is given. This permits the user to find more rapidly the necessary temperature to obtain the desired results. Some space is left at the end of each table to permit addition of further analyses as they are published by the various research laboratories which are at present making austenite transformation studies.

★ ★ ★

FIGURE 6 shows the correspondence between some of the time values used in the tables. The abbreviations used are s for seconds, m for minutes, h for hours, d for days and w for weeks. Abbreviations have also been used in the Hardness columns: B corresponds to Brinell, C to Rockwell, Rc scale, Rb to Rockwell scale and V to Vickers Hardness Number.

★ ★ ★

IN certain instances it was difficult to make the "start" and "finish" transformation curves of certain steels fit the prototypes shown in Figures 1 to 4. If low values are given for S_2 and S_3 then the nose is open. If only one low time value is given, for S_2, the "start" shows a continuous curve. A similar statement may be made for the "finish" transformation curve, although in the latter, the time values should be rather large.

★ ★ ★

IN the last hardness column data on conventional hardening where given have been compiled and the following abbreviations have been used: W for water quenching, O for oil, B for brine and A for air cooling. In most instances the same austenitizing temperature was used as given for the corresponding I-T curve.

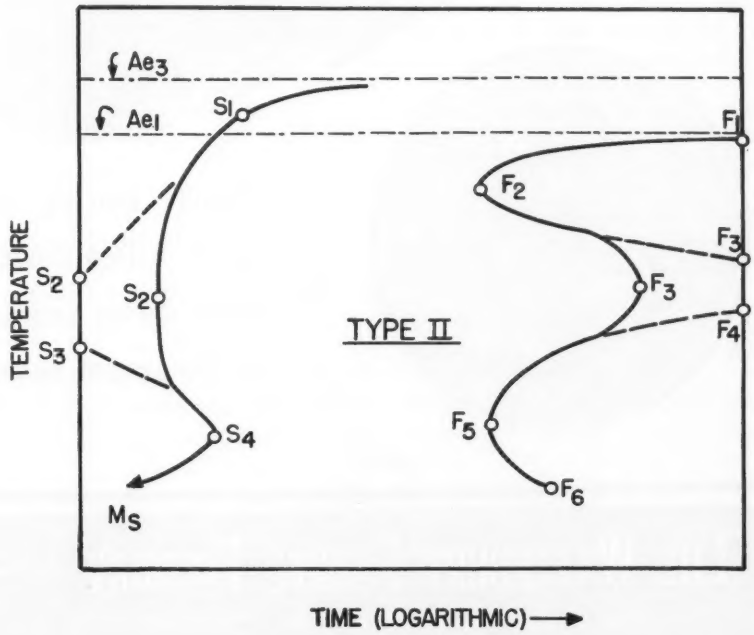
★ ★ ★

F_2			F_3			F_4			F_5			F_6				
°F	TIME	HARD	°F	TIME	HARD.	°F	TIME	HARD.	°F	TIME	HARD.	°F	TIME	HARD.	HARDNESS	NO.
1200	35s	C-23														71
1180	30s	C-31	900	5m	C-35				800	3m	C-41	540	10^3s	C-56		72
1190	14m	C-26	900	1h	C-26	750	11m	C-37	500	25m	C-54	300	15m	C-61	C-590	73
1190	2m		1040	10^3s		930	1m		750	2m						74
1290	12m	V-180	930	2w	V-344	750	2m	V-365	570	5m	V-435				V-490.W	75
1330	14m	"B"-78	1110	10^5s	"B"91										C-36.W	76
1300	4.10^3s		1260	10^4s		1030	10^3s		840	120s		700	200s			77
1200	50s	C-26	950	25m	C-31				780	4m	C-38	460	10^4s	C-52	C-61.B	78
1220	1 5m	C-22	1100	10m												79
1200	50s	C-31							720	400s	C-45	600	10^3s	C-52		80
1200	10^3s	C-12	1025	2.1d	C-19	850	50s	C-30	700	3m	C-36+					81
1060	100m	V-245	900	30s	V-284				800	40s	V-314				V-652	82
910	20s		800	10s		600	10s		500	10s						83
1200	15m	C-16	1060	15^5s	C-23	865	10^5s	C-26	600	15m	C-49				C-61	84
1200	13m	C-21	1100	5h	C-26											85
1200	500s	C-12	1080	1h	C-17	830	1m	C-35	700	200s	C-43					86
1180	9m	C-18	850	5.5h	C-30				670	10^3s	C-42	600	20m	C-50		87
1180	40s	C-21	940	40m	C-29				705	22m	C-42	600	40m	C-50	C-61	88
1170	80s	C-30	845	45m	C-33				750	24m	C-40	600	1h	C-49	C-63	89
																90
																91
																92
1090	83m	C-17	900	50m	C-20				650	30m	C-48	540	10^4s			93
1000	2h		800	90s		600	500s									94
1000	5h		800	110s		600	500s									95
1000	5h		600	120s		600	500s									96
1000	10^4s		800	3m		600	10m									97
1050	1½h		800	2m		600	10^3s									98
1000	18m		800	3m		600	10^3s									99
1000	4h		800	10^3s												100
1050	2h		800	3m		600	10^3s									101
930	140s		850	500s		825	500s		700	200s		445	500s			102
1250	3m	C-12	1100	30m	C-17	830	10^3s	C-26	600	8h	C-48				C-62	103
1170	50h		890	50h		660	30m		570	2h						104
1220	260s		1010	50m		900	20m		630	10^4s						105

IN conclusion, from the T-T-T curves which can be drawn from the data here collected one may obtain approximately the beginning and the ending time (of very practical importance) of austenite transformations at intermediate temperatures; the average transformation velocity, and make a prediction of the products formed on cooling at rates less than the critical cooling velocity or on holding at given temperatures, and isothermal quenching. It is recommended that the original papers be consulted for more definite details. Figure 6 is a work sheet to be used to draw the curves when no semi-log paper is available. To show the use of Figure 6 two examples of curves selected at random are given in Figures 7 and 8. The data were taken from the tables and indicated on a piece of transparent paper mounted on Figure 6. These sheets, if properly labelled, can be saved for future reference.

(End of Part II)

Fig. 2. REPRESENTATIVE CURVES FOR TYPE II ALLOYS



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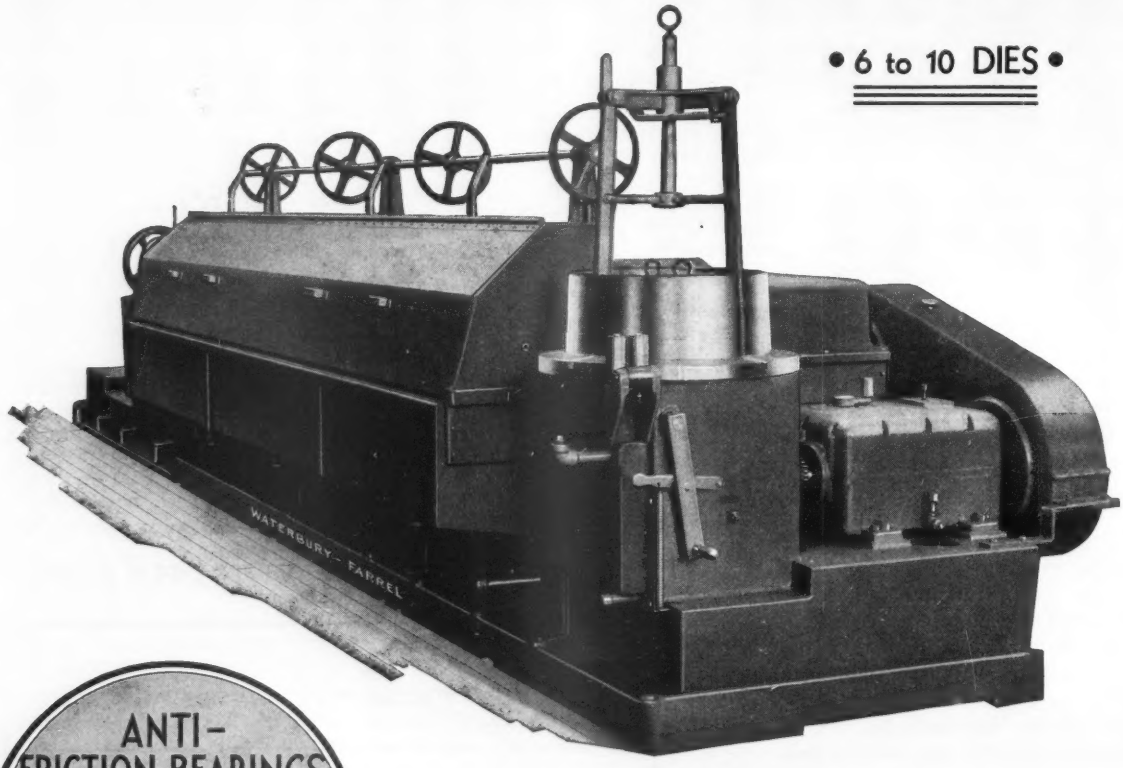

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Glass Yarn Improves Performance Of Nonmetallic-Sheathed Building Cable

By Harry O. Collis, Electrical Engineer,
Owens-Corning Fiberglas Corporation,
Toledo, Ohio

A description of the use of glass in the component parts of nonmetallic-sheathed building cable. How the use of glass yarn improves the performance of the cable.

WIDE acceptance of glass yarn by the wire and cable industry has resulted in the use of large quantities of glass in various component parts of nonmetallic-sheathed building cable. A large number of people have had experience in handling and applying cable incorporating glass yarn. This has led to many requests for information on the performance of glass yarn, and on how the use of glass yarn contributes to and improves the performance of the cable. This is an opportune time to answer some of these questions and to describe in some detail the properties of glass which have been used to advantage by wire and cable designers.

★ ★ ★

GLASS yarn is resistant to the effects of fungus, one of the foremost enemies of nonmetallic-sheathed building cable. Tests made by the Tropical Testing Program of the **University of Pittsburgh** on standard commercial products have shown that fungus will grow on and will weaken practically all of the materials commonly used in nonmetallic-sheathed building cable. Such organisms will grow on materials reinforced or insulated with glass yarn, but they do not appreciably affect the strength of the glass.

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IN one of the tests made at the **University of Pittsburgh,** both cotton and glass yarn of similar size were exposed to accelerated fungus growth conditions for four weeks. This test cycle corresponds roughly to six months of actual service in the tropics. The glass yarn, which was not treated with a fungicide, retained 84 per cent of its original strength; while the waxed cotton, which was treated with a fungicide, retained only 58 per cent of its original strength. The results of this test indicate that even under exposure to the severest of fungus growth conditions, the glass yarn would remain strong and durable.

★ ★ ★

THE penetration of moisture under high humidity conditions is another serious problem in the use of nonmetallic-sheathed building cable. The filaments of the glass yarn are like tiny glass rods; therefore, moisture cannot penetrate into the interior of the filament, as is the case with organic materials which are cellular in structure. This fact is borne out by a series of comparative tests made by the **Electrical Testing Laboratories** in New York City on standard commercial nonmetallic-sheathed building cable (ETL Report No. 320948). In the tests, samples of various types of cable were tested for moisture absorption as specified by the Underwriters' Laboratories Standard for Nonmetallic-Sheathed Cable. The results of the tests are shown in Table 1.

★ ★ ★

IN order to test cables manufactured as nearly alike as possible, samples of both glass and cotton braided nonmetallic-sheathed building cable were obtained from each of six manufacturers. As required by **Underwriters' Laboratories,** samples were flexed both at room temperature and after being cooled to a temperature of O°C. In every case, cable made with a glass yarn outer braid shows lower moisture absorption than cable made by the same manufacturer using an organic yarn outer braid. Even after being flexed at O°C, the glass braids show lower moisture absorption, averaging about 60 per cent of that obtained with organic braids subjected to the same treatment. The results of the test indicate that the glass braided cable is less affected by high humidity conditions than cable made with an organic yarn braid.

★ ★ ★

ONE of the outstanding properties of glass yarn is its great tensile strength. At room temperature, the breaking strength of glass yarn is several times greater than the breaking strength of similar size commonly used organic yarns. Glass yarn will retain a high percentage of its original strength even after exposure to high temperatures.

★ ★ ★

THE effect of heat on glass yarn and organic yarn is indicated by Figure 1. The curves show comparative breaking strength of

Table I

Gain in Weight, per cent of braid

Conductor Insulation	Specimen Wound Flat				Specimen Wound on Edge			
	Room Temp.		"Cold"		Room Temp.		"Cold"	
	Cotton	Glass	Cotton	Glass	Cotton	Glass	Cotton	Glass
Rubber	5.75	3.7	13.3	6.1	4.7	4.5	7.4	6.0
Thermoplastic	5.0	3.0	8.0	4.6	4.6	3.1	8.9	4.6

glass and organic tapes of the same size after exposure to heat up to 1000°F. The strength of tapes made from organic yarns decreases rapidly upon exposure to temperatures higher than 300°F. The strength of tape made of glass yarn is not impaired by temperatures up to 400°F., and still has approximately 20 per cent of its original strength even after exposure to temperatures over 800°F. Thus, hot compounding operations by the cable manufacturer do not affect the strength of glass yarn braids.

★ ★ ★

NONMETALLIC - SHEATHED building cable is not designated for outdoor use. However, a weathering test is one more method of measuring relative life of materials. Figure 2 shows breaking strength of glass tape and organic tape of the same size after exposure in a weatherometer. The glass tape retains nearly 20 per cent of its breaking strength after 1500 hours exposure, while the strength of the organic tape is practically gone after 100 hours under the same conditions.

★ ★ ★

A FURTHER indication of the permanence of glass yarn is shown in Table 2. In this case, glass yarn has been exposed to normal room conditions over a period of 48 months. Tests of breaking strength made at intervals over the 48 months indicate that the glass yarn is unaffected by age. Each value given in the table represents the average of 60 individual breaking strength tests.

Table 2

Aging Tests Glass Yarn

Months	Average Breaking Strength Pounds
—	18.2
3	19.2
6	18.0
9	17.6
12	18.8
15	19.2
21	17.1
30	17.9
33	18.7
36	17.8
39	18.6
43	19.2
46	19.3
48	18.9

★ ★ ★

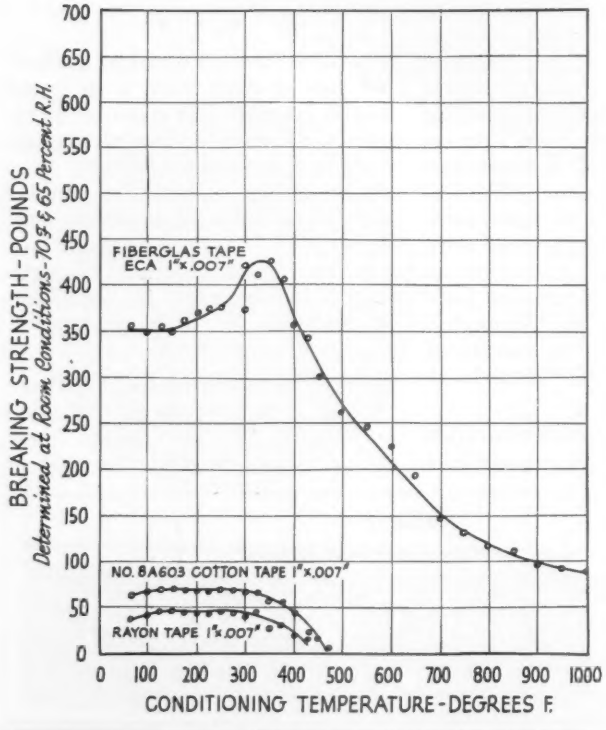
WHEN glass yarns were first used in the manufacture of nonmetallic-sheathed building cable, some difficulty was encountered in obtaining sufficient abrasion resistance. Now, however, manufacturing experience has resulted in the development of techniques which give thorough impregnation and maximum adhesion between the compound and the glass yarn. The resulting cable jackets are tough and durable and have abrasion resistance more than sufficient to meet the conditions encountered in the application of the cable.

★ ★ ★

THE wire and cable industry has made considerable progress in the development of new types of nonmetallic-sheathed building cable. The majority of the development work is being concentrated on films, both thermoplastic and synthetic rubber types. The objective is to make a more rugged

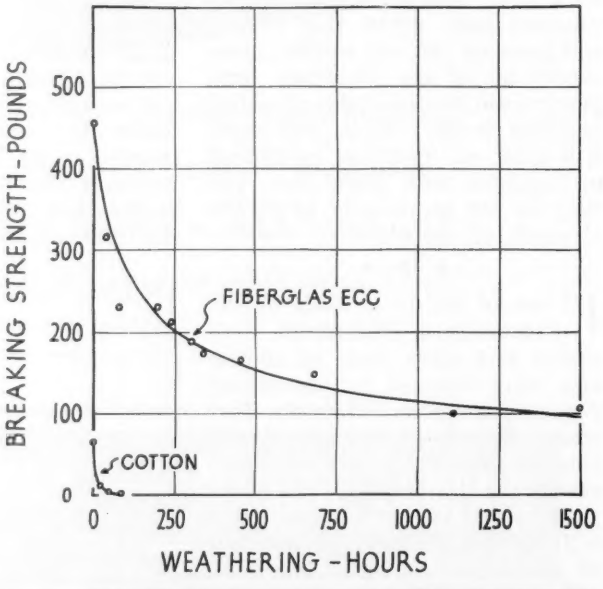
(*Please turn to page* 188)

BREAKING STRENGTH OF FIBERGLAS AND OTHER TAPES AFTER 1 HOUR AT TEMPERATURE SHOWN



BREAKING STRENGTH OF 1"x.010" TAPE

after weathering on National Carbon model X-1-A



LABOR RELATIONS

By John B. Stone,

Washington, D. C.

The Twenty-second in a series of articles on the subject, with particular reference to problems of the wire and wire products industry. The author is a noted authority on the subject.

THE big guns of American organized labor will be directed in an ever greater concentration during 1949 on two main objectives—an increase in the minimum pay under the Federal Labor Standards Act and a shortening of the work week without any reduction in take home pay. Both "horns" of this offensive drive will be felt eventually by all manufacturers and the producers of wire and wire products in the smaller size categories may feel the effects first.

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CHOSEN method for realizing the first part of the dual objective is through pressure on the 81st Congress. Both AFL and CIO backed by the larger independent unions, will bring all possible influence to bear upon the national legislators before the so-called "honeymoon" period between President Truman and the Congress has cooled down to mutual distrust.

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THREE bills to increase the minimum wage from its present 40 cents an hour floor, were introduced before the 81st Congress was two days old. Sums named as a substitute for the 40 cent floor ranged from 60 cents through 75 cents to one dollar. But reopening of the labor standards question, according to trained Washington observers implies a change much more significant than a mere rise in the level of the wage floor.

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ALL the progressive, radical and middle of the road labor forces in the capital will attempt at the same time to broaden the coverage of the fair standards act to include all possible workers. Thus the management of small wire and wire products plants, which in many cases now has no problem in connection with pay for white collar workers and other unorganized help, may before the year is out, be faced with a federal law setting a minimum of one dollar an hour for these workers.

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THE second half of labor's 1949 objective will be approached in different manner by the two major federations. The AFL wants a national agreement to reduce the work week and keep pay envelopes at present thickness, to be worked out at a national labor management conference sponsored by the president.

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HERE the CIO leadership departs. They are willing to attend such a conference if it should be called by the president but they want more than voluntary agreements, the CIO wants legislation backing up their demands.

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THE drive for the shorter work week is the result of the growing fear in both AFL and CIO camps, that full employment at a 60,000,000 level cannot go on forever. Daniel W. Tracy, President of the AFL Electrical Workers, head of a special commission to investigate a shorter work week, made his first official report early in January. The timing was significant. Railroads, and several soft goods groups of manufacturers such as shoes and textiles, had just laid off thousands of men.

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TRACY said in expressing the general unrest of labor, that the Marshall plan and the military defense programs could not be expected to last forever. He made it plain that the AFL would prepare a program looking toward the permanent maintenance of the 60,000,000 job level through spreading work. In order to do this he said a national 30 hour week would have to become the standard.

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THE CIO, in seeking the same general idea of a shorter work week, is placing its long range emphasis on the guaranteed annual wage. This arrangement would leave the individual employer free to work out his guaranteed annual wage on whatever basis he saw fit. But similar attempts in the past, despite a lot of hopeful propaganda have not brought much concrete success.

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CIO, AFL and the independents are again singing in unison when they set up the financial justification for their drive to shorten hours and maintain total wages. They claim that the "huge profits" of the last three years have enabled industry to expand facilities, put in new equipment and make general improvements which otherwise would have required new capital investment raised through sale of stock. An AFL spokesman told the Flanders joint Senate-House committee investigating profits, that 70 percent of plant expansion in the last year, came from profits. He was loudly seconded by CIO representatives.

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LABOR leaders claim that now industry has passed the peak of expansion, funds formerly used for that period can be put into wages, without resulting in any net loss to stockholders. From dozens of appearances at investigations and conferences in the na-

(*Please turn to page* 192)

New Symbol Standards Published

A NEW publication in the series of standard letter symbols for use in technical and scientific writing has just been announced by the **American Standards Association.** This is the American Standard Letter Symbols for Physics, Z10.6-1948. Thirty-six national societies, associations, and governmental departments took part in the work which resulted in agreements on the standard symbols.

★ ★ ★

ALL common terms in elementary physics and some in advanced physics and related fields are included. Most symbols in mathematics, crystallography, meteorology, x-rays, statistics, and so forth, have been omitted.

★ ★ ★

COPIES of the American Standard Letter Symbols for Physics, Z10.6-1948 can be obtained from the American Standards Association, 70 East 45 Street, New York 17, New York for $1.00 per copy. Other standards in the series are: Mathematical Symbols, Z10f-1928; Abbreviations for Scientific and Engineering Terms, Z10.1-1941; Letter Symbols for Hydraulics, Z10.2-1942; Letter Symbols for Mechanics of Solid Bodies, Z10.3-1948; Letter Symbols for Heat and Thermodynamics Including Heat Flow, Z10.4-1943; Letter Symbols for Chemical Engineering, Z10.12-1946; Illuminating Engineering Nomenclature and Photometric Standards, Z7.1-1942; and Letter Symbols for Gear Engineering, B6.5-1943.

★ ★ ★

Instrument Society to Meet in Toronto

THE Fourth Annual Spring Meeting of the **Instrument Society of America** will be held at the Royal York Hotel, Toronto, Canada, May 12 and 13, according to an announcement by Ed Grace, Chairman of the National Meetings Committee and Chief Instrument Engineer of the Sun Oil Company.

★ ★ ★

THE tentative program will include four technical sessions and a dinner on Thursday evening, May 12th. The technical program will be under the direction of Lyman Allen, Jr., Chairman of the Papers Subcommittee of the National Meetings Committee and Assistant Design Engineer, American Viscose Company. The meeting will be of interest to engineers engaged in measurement, inspection, testing and automatic control.

★ ★ ★

A. S. & W. Studying Donora Conditions

AS a further step in attempting to clear up the circumstances surrounding the deaths of nineteen persons during the course of a heavy five-day smog at Donora, Pa., recently, the **American Steel & Wire Co.** has engaged the Kettering Laboratory of Applied Physiology in the College of Medicine of the University of Cincinnati to conduct an investigation in the area to determine what conditions contributed to the tragedy. The Wire Company, a U. S. Steel subsidiary, operates a steel and wire manufacturing plant and a zinc works in the community.

★ ★ ★

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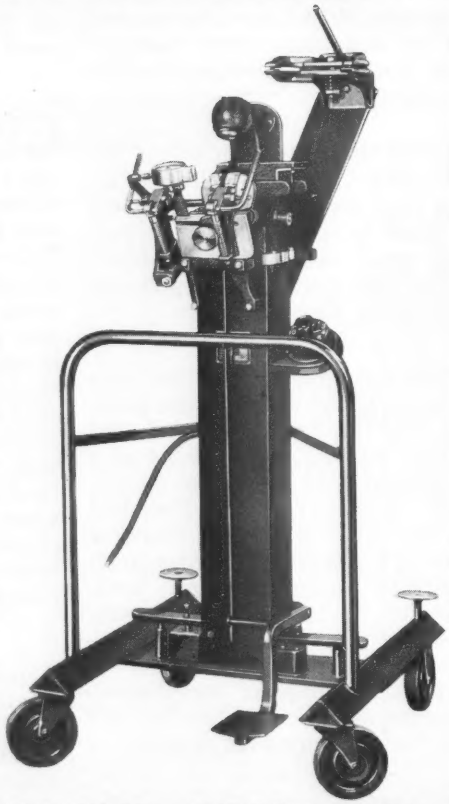

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continue to do everything possible to clear up the mystery surrounding the tragic occurrence," H. B. Jordan, operating vice-president of the company, stated. "The Kettering group is a highly regarded authority on problems of industrial and public health. Originally established in 1930, the Laboratory operates under the auspices of the University of Cincinnati. Full cooperation will be extended to all other qualified agencies working on the case."

* * *

THE work of the Laboratory is concerned primarily with occupational hazards and diseases, their nature and significance, and the means of preventing them.

* * *

1949 Directory of Occupational Safety Posters

A 72-PAGE directory containing 744 illustrations of two, three and four color posters, classified under 15 sections has been prepared by the **National Safety Council.** A convenient index quickly locates posters on specific accident hazards. Posters illustrated range in size from 8½ x 11½ inches to 10 x 12 feet.

* * *

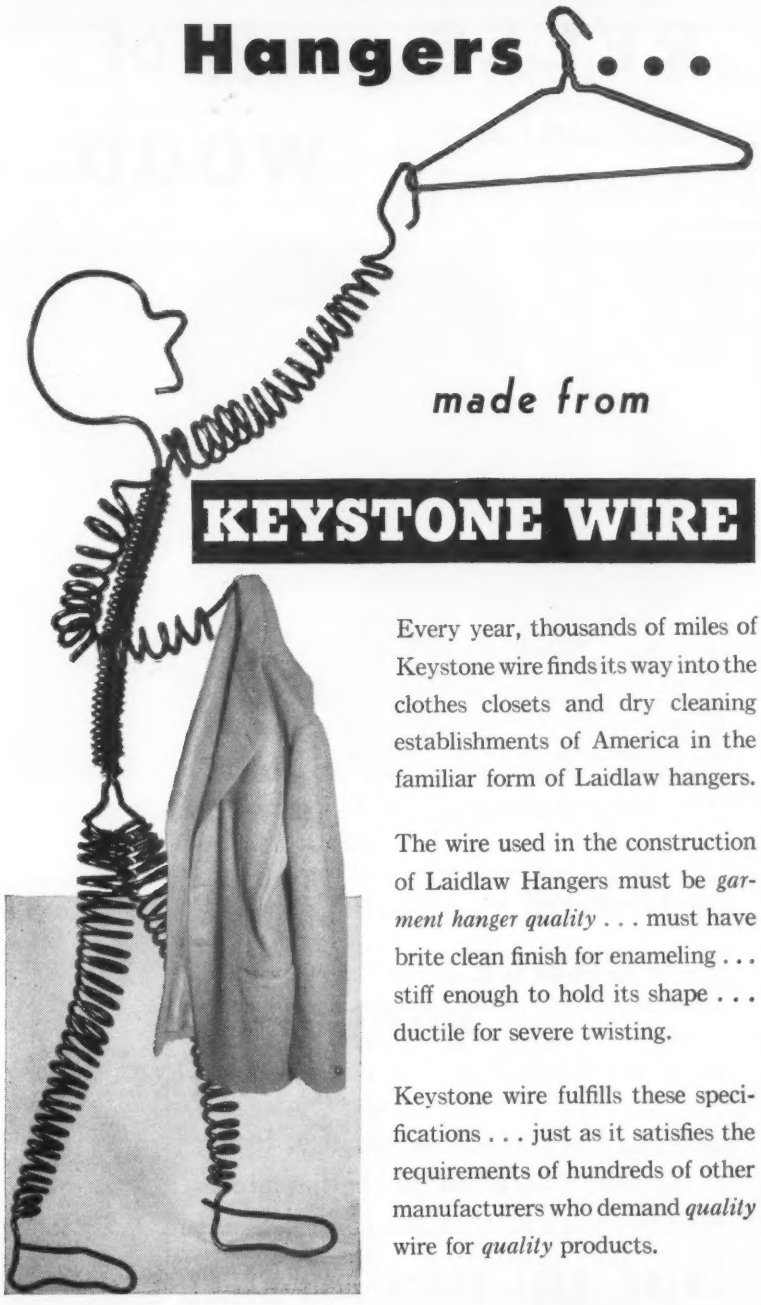
YOU may order a copy from the National Safety Council, 20 North Wacker Drive, Chicago 6, Ill.; price of the directory is 50 cents.

* * *

Spectral-Transmissive Properties and Use of Eye-Protective Glasses

CONSERVATION of eyesight is one of the foremost problems confronting safety engineers today. They have found that protection of the eyes from excessive exposure to radiant energy is as important as protection from mechanical injury. Information on the transmissive properties of most of the widely distributed makes of tinted lenses is now available in a new circular, **Spectral-Transmissive Properties and Use of Eye-Protective Glasses,** re-

Millions of **LAIDLAW** * **Hangers . . .**



made from

KEYSTONE WIRE

Every year, thousands of miles of Keystone wire finds its way into the clothes closets and dry cleaning establishments of America in the familiar form of Laidlaw hangers.

The wire used in the construction of Laidlaw Hangers must be *garment hanger quality* . . . must have brite clean finish for enameling . . . stiff enough to hold its shape . . . ductile for severe twisting.

Keystone wire fulfills these specifications . . . just as it satisfies the requirements of hundreds of other manufacturers who demand *quality* wire for *quality* products.

**Laidlaw Wire Company Peoria, Illinois*

KEYSTONE MUSIC SPRING WIRE

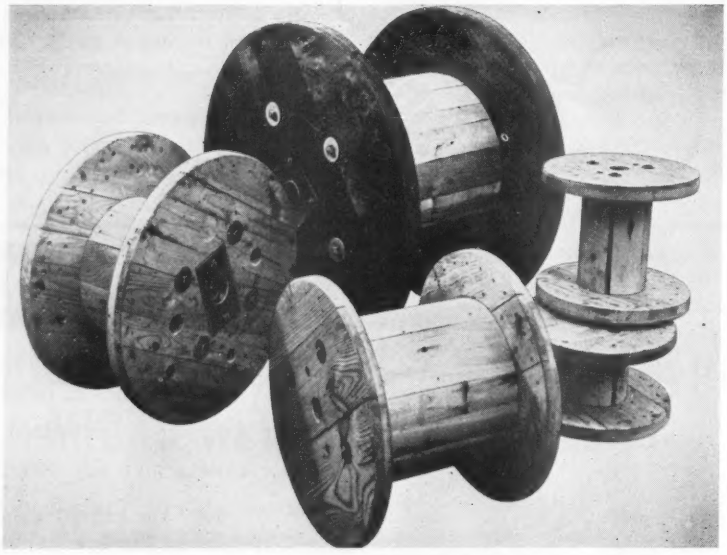
KEYSTONE STEEL & WIRE CO. PEORIA, ILLINOIS

SPECIAL ANALYSIS WIRE for all industrial purposes

KEYSTONE STEEL & WIRE COMPANY
PEORIA 7, ILLINOIS

REELS made of WOOD

RETURNABLE AND NON-RETURNABLE



Bridge SHIPPING and SHOP REELS are furnished assembled or knocked down, made to your specifications. Built to withstand severest handling. Sturdy, strong, low in cost. Made for

CABLE, ROPE and WIRE

Made in any size, from 12" to 96" in diameter.

ALSO, REEL HEADS FOR STEEL DRUMS

Send us your specifications and let us quote on costs.

BRIDGE MFG. CO., Inc.

HAZARDVILLE • CONNECTICUT

cently issued by the National Bureau of Standards.

* * *

THIS publication is the result of a study of the spectral-transmissive properties of about 200 glasses intended for use either as sun glasses or in special industrial operations where injurious amounts of radiant energy are present. Extensive consideration is given to elimination of glare, color distortion, use of glasses for night driving, standardization of glasses for outdoor and industrial purposes, and the spectral-transmissive properties of glasses for use under various types and intensities of ultraviolet, luminous, and infrared radiation. It is proposed that sun glasses be grouped into three or four shades having luminous transmittances of 60, 35, 25, and about 10 per cent respectively, values that correspond roughly to those for the industrial shades numbered 1.5, 2.0, 2.5, and 3.0.

* * *

NATIONAL Bureau of Standards Circular C471, Spectral Transmissive Properties and Use of Eye-Protective Glasses — 34 large 2-column pages, 93 figures, can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at a cost of 20 cents a copy.

* * *

A. S. & W. Increases Steel Capacity

STEEL capacity at **American Steel & Wire Company's** Duluth Works will be increased 243,000 tons a year, or 35 per cent, as a part of a replacement, improvement and rebuilding program announced recently by **B. E. Pheneger,** district manager of operations for this United States Steel subsidiary. The Duluth Works, only steel producing plant in the northwest, turns out steel, semi-finished steel products, wire, and manufacturers and merchant wire products. It has 3500 employees.

* * *

Outstanding Personalities of the Wire Industry

Baker-Raulang Elects New President

IT has just been announced that **James W. Moran** has been elected president of **The Baker-Raulang Company** to succeed E. J. Bartlett who becomes president emeritus and continues as a director. The change became effective January 1, 1949. The company is a leading manufacturer of power industrial trucks and rubber-tired machinery and operates two plants in Cleveland.

* * *

MORAN, who is a native Clevelander, joined the company in 1911 as a clerk in the Stock Record Dept. After being employed successively in the Service, Purchasing and Accounting Depts., in 1916 he became auditor. In 1920 he was elected assistant treasurer and, in 1934, secretary, treasurer and director.

* * *

Wright Advanced by Continental

APPOINTMENT of **Eugene K. Wright** as sales manager, Manufacturers' Division, **Continental Steel Corporation,** Kokomo, Indiana, has been announced by Edmond P. Severns, company vice-president in charge of sales.

* * *

MR. WRIGHT became connected with the company in 1939 as sales representative of the Manufacturers' Division following his graduation from Purdue University. He entered the armed services in 1941, rising to rank of major. He resumed his connections with Continental in 1945.

* * *

MR. WRIGHT takes over the position formerly held by Mr. K. H. Striebel who has resigned.

* * *

Norton Company Names Jeffries as Distributor

NORTON COMPANY, Worcester, Mass., has recently announced the appointment of **Jeffreys Engineering** and **Equipment Company,** Guilford Building, Greensboro, N. C., as distributor of Norton grinding and lapping machines with exclusive representation in North Carolina and South Carolina.

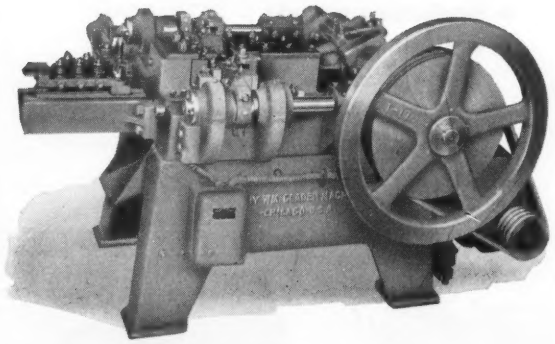
* * *

Hoffman and Nordstrom Retire from Norton Company

OSCAR E. NORDSTROM, Norton Company machine division consultant for the Chicago territory retired from active service December 31 after 44 years with the company.

* * *

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS
210 No. Racine Ave.
Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

JOINING the grinding wheel end of the business in 1904, Mr. Nordstrom transferred to the machine division in 1919. He was appointed salesman for the Cleveland area in 1921 and became district manager for the Chicago office in 1926. He was made consultant in 1947.

★ ★ ★

PAUL HOFFMAN, machine division district manager of Norton Company's New York office, retired December 1, 1948, after 35 years with the company. He is succeeded by **B. Harold Lewis,** formerly machine sales representative for the New England area.

★ ★ ★

MR. HOFFMAN began his career with Norton Company in its abrasive division in 1913. Transferring to the machine division in 1930, he was appointed Philadelphia district manager shortly afterwards. In 1929 he was transferred back to the abrasive division and a year later reassigned to the position he now leaves.

★ ★ ★

MR. LEWIS came to Norton Company in 1915 and entered machine division sales in 1922. He became New England Sales representative in 1947.

★ ★ ★

Changes in Du Pont Finishes Division

TRANSFERS involving the managers of three plants of the Finishes Division of the **Du Pont Company** were announced in December.

★ ★ ★

E. J. MACFARLAN, manager of the plant at Fort Madison, Iowa, was transferred to South San Francisco, California.

★ ★ ★

P. J. GRIFFIN, plant manager at South San Francisco, was transferred to Everett, Mass.

★ ★ ★

H. F. BODIN, manager of the Everett plant, was transferred to Fort Madison.

★ ★ ★

MR. MACFARLAN received his degree of bachelor of science in chemistry at Union College in 1920. He joined the DuPont Company in 1926 as a supervisor in the paint, varnish and lacquer plant at Parlin, N. J. In 1941 he became manager of the Everett plant. In 1942-43 he was with the Remington Arms Company, a Du Pont subsidiary, after which he returned to Wilmington as assistant to the director of production of the Finishes Division. He became manager of the Fort Madison plant in October, 1947.

★ ★ ★

MR. GRIFFIN received his bachelor of science degree in chemical engineering from New Hampshire College in 1917. He started his career with Du Pont in the paint factory at Philadelphia in 1927. He was made super-

The **SPECIALISTS** in
Wire-Straightening and Wire-Cutting!

Diameter Range — 1/16" to .005"

PRECISION - Our Motto

DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

ASK ABOUT OUR UNEXCELLED FACILITIES FOR CLEANING AND POINTING WIRE ALREADY STRAIGHTENED AND CUT.

ALL TYPES OF WIRE...

- Nickel
- Stainless Steel
- Bronze
- Brass
- Copper
- Alloy Wire
- Music Wire
- Tag Wire
- Florist Wire

Write us today!

Manufacturers of the famous ARMA PAPER CLIP

PITTSBURGH CUT WIRE COMPANY
1112-20 GALVESTON AVENUE · PITTSBURGH, PENNSYLVANIA.
TELEPHONE: CEdar 4702

intendent of the Everett plant in 1935. In 1941 he was transferred to Fort Madison as superintendent, and in 1942 went to South San Francisco as plant manager.

★ ★ ★

MR. **BODIN** joined the Du-Pont Company in 1921, and was stationed for a long time at the Chicago paint laboratory and plant, where he rose to assistant manager. In 1940 he was made assistant to the director of production of the Finishes Division in Wilmington. He went to Fort Madison as plant superintendent in 1942 and in 1947 was transferred to Everett, Mass., as plant manager.

★ ★ ★

Oakite Appoints New Sales Manager

ANNOUNCEMENT has been made by **Oakite Products, Inc.**, New York, of the appointment of **Frank L. Oldroyd** as Sales Manager of its Industrial Division.

★ ★ ★

Mr. Frank L. Oldroyd, Sales Manager, Industrial Division, Oakite Products, Inc. * * * *

MR. **OLDROYD** has been associated with the Oakite organization in the servicing of its specialized industrial cleaning and allied materials for over fifteen years, having spent eleven of these years as an Oakite field service territorial representative in various sections of the country. Subsequent promotions found him acting in the capacity of Division Manager in the company's divisional offices in Atlanta and Chicago for a period of two and one-half years, then as special Field Sales Manager for a year prior to his most recent appointment.

★ ★ ★

MR. **OLDROYD** has already assumed his new duties and will direct the activities of Oakite's nationwide industrial field staff from the company's general offices in New York.

★ ★ ★

A new electrical wire with rubber insulation that improves when soaked in water, is designed for use underground and in wet locations. High moisture resistance, longer life, increased safety are claimed.

WEAN EQUIPMENT Corporation

THE WEAN EQUIPMENT CORPORATION are recognized as specialists in high-efficiency strip and wire mill and straightening equipment.

COLD ROLLING MACHINERY

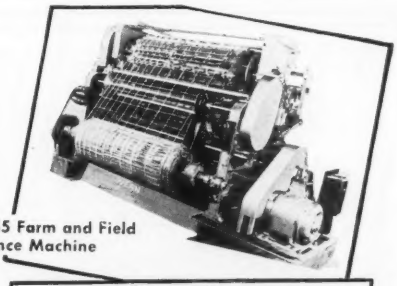
For 36" Wide Material and Narrower

MILLS - REELS - SLITTERS - LEVELERS
COILERS - EDGERS - SCALE BREAKERS - SHEARS
SCRAP BALLERS - CONTINUOUS PICKLING

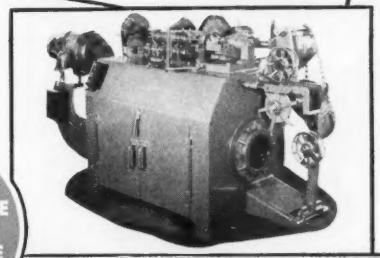
WIRE MILL EQUIPMENT

PATENTING, GALVANIZING AND TINNING TAKE-UP FRAMES
WIRE FLATTENING MILLS - SPOOLERS - NAIL GALVANIZING AND BLUEING EQUIPMENT - FIELD FENCE AND BARBED WIRE MACHINES
TUBE BAR AND SHAPE STRAIGHTENING MACHINERY

WEAN EQUIPMENT CORPORATION
22800 LAKELAND BLVD • CLEVELAND, OHIO

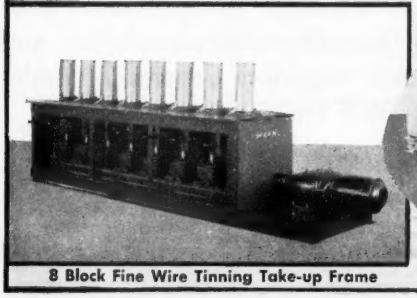


No. 1155 Farm and Field Fence Machine

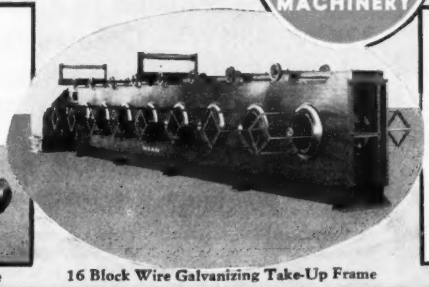


Barbed-Wire Machine

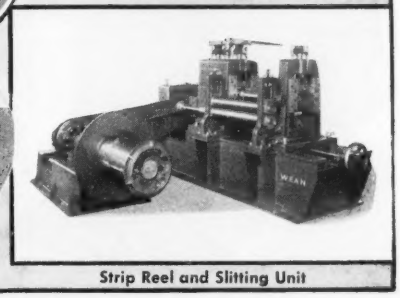
HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY



8 Block Fine Wire Tinning Take-up Frame



16 Block Wire Galvanizing Take-Up Frame



Strip Reel and Slitting Unit

Wylie Brown Recently Elected Chairman of the Board and Whipple Jacobs, President, of Phelps Dodge Copper Products Corporation

WYLIE BROWN, President of Phelps Dodge Copper Products Corporation, has been elected Chairman of the Board of Directors and will continue as chief executive officer of the Corporation according to announcement recently.

Wylie Brown, Chairman of the Board, Phelps Dodge Copper Products Corporation. * *

* * *

WHIPPLE JACOBS, formerly president of the Belden Manufacturing Company of Chicago, on January First joined Phelps Dodge Copper Products Corporation as president.

* * *

MR. BROWN has been president of the Corporation since it was founded and both he and Mr. Jacobs are widely known in the copper industry.

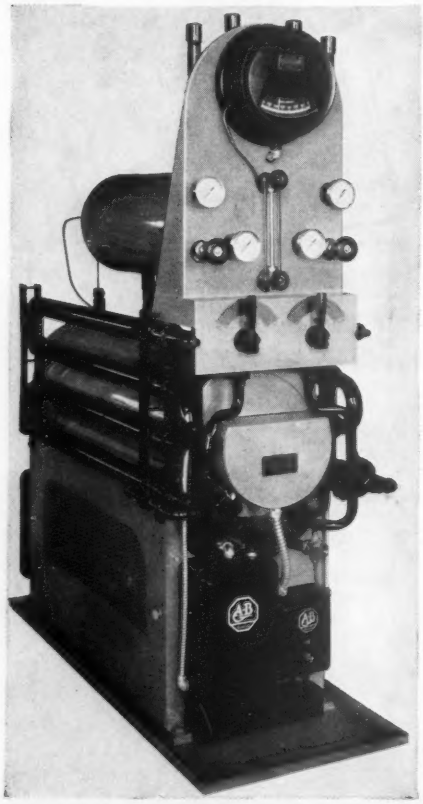
* * *

THE company is to be congratulated on securing the services of so fine a man as Mr. Jacobs, whose long experience and capabilities will be given a fuller opportunity for expression in his new responsibilities. His large circle of friends wish him every success in his new activities.

PHELPS DODGE COPPER PRODUCTS CORPORATION is one of the largest fabricators of copper in the world, with mills at Yonkers, N. Y.; Elizabeth, New Jersey; Fort Wayne, Indiana, and Los Angeles, California.

* * *

Whipple Jacobs, President, Phelps Dodge Copper Products Corporation. * * * * *



THE ROYLE TEMPERATURE CONTROL UNIT

For Extrusion and Other Industrial Uses

A compact, simply operated unit designed to sustain any pre-determined temperature between 90°F and 475°F.— Hand-lever selection of desired temperature — Heat supplied — or drained —according to operational requirements — Formed piping, elimination of gaskets, and drip pans promote cleanliness — Breakdown of heat transfer oil reduced to a minimum — Two standard sizes 32KW, 48KW— Other units with water circulation and refrigeration for operations requiring constantly maintained lower temperatures, 35°F to 200°F.

JOHN ROYLE & SONS ROYLE PATERSON N. J.

PIONEER BUILDERS OF EXTRUSION MACHINES SINCE 1880

London, England James Day (Machinery) Ltd REgent 2430 | Home Office E. B. Trout J. W. VanRiper SHerwood 2-8262 | Akron, Ohio J. C. Clinefelter JEfferson 3264 | Los Angeles, Cal. H. M. Royal, Inc. LOgan 3261

PATERSON 3, NEW JERSEY

Carboloy Advances Crump, Gillespie, and Dobbrodt

HARRY CRUMP, for the past year Manager of Cutting Tool Sales Engineering, **Carboloy Company, Inc.,** Detroit, has been named Assistant to the Sales Manager, according to K. R. Beardslee, Vice President and Marketing Manager at Carboloy.

★ ★ ★

J. S. GILLESPIE, formerly in charge of Wear Parts Sales Engineering, has been appointed Manager of Tool and Wear Parts Sales Engineering, succeeding Mr. Crump.

★ ★ ★

A. F. DOBBRODT, formerly Special Products Sales Engineer, has been advanced to Manager of Mining Sales Engineering. Dobbrodt will be responsible for all sales engineering activities in connection with developing markets for such special Carboloy products as Sinta-Set diamond core drills for exploratory drilling in the coal, oil, and mineral mining fields.

★ ★ ★

W. C. Husted Elected Vice Pres. Of Chase Brass & Copper

WALLACE C. HUSTED, vice president in charge of plant operations and organization of **Chase Brass & Copper Company** since October, 1946, has been appointed executive vice president of the corporation. Mr. Husted has been associated with the company since 1929.

★ ★ ★

MR. HUSTED is the first officer of the company to fill the executive vice presidency since 1942 when Charles E. Hart vacated the position to succeed Frederick S. Chase as president.

★ ★ ★

WHEN Mr. Husted came to Waterbury from Springfield, Mass., he established a cost accounting system at the company's Waterbury Manufacturing Co. division. In 1931 he became factory manager and subsequently promoted to general division manager for the supervision of both manufacturing and sales operations.

★ ★ ★

IN July, 1944, he was elected vice president and assigned to the Chase's plant in Cleveland.

★ ★ ★

MR. HUSTED is a native of Norwalk, Conn. He is a graduate of the Boston University, where he was awarded a degree in business administration.

★ ★ ★

Electric Furnace Appoints R. R. Griner, Western Sales Agent

THE ELECTRIC FURNACE COMPANY of Salem, Ohio, announces the appointment of **R. R. Griner,** 3012 McGee Trafficway, Kansas City 8, Mo., as its Western Sales Agent.

★ ★ ★

MR. GRINER, who until recently has been the Furnace Engineer for the Wright Aeronautical Corp. of Paterson, N. J., was formerly an erection and service engineer with The Electric Furnace Company.

★ ★ ★

CALENDAR OF 1949 WIRE ASSOCIATION ACTIVITIES

April 15th: ANNUAL DIRECTORS' MEETING, Biltmore Hotel, New York City. Directors meet at 10 A.M. Luncheon for Directors and Wire Association members, 1 P.M. Get-together at 12 M.

April 22nd: WORCESTER REGIONAL MEETING, Sheraton Hotel, Worcester, Mass. Get-together, 6 P.M. Dinner at 7 P.M., followed by lecture and film showing.

April 28 and 29: CANADIAN REGIONAL MEETING, Mount Royal Hotel, Montreal, P.Q., Can. Technical papers, dinner, plant visits.

June 10th: PACIFIC COAST REGIONAL MEETING, Biltmore Hotel, Los Angeles, Cal. Registration, 10:00 A.M. Plant visit. Dinner and technical session, 7 P.M.

October 17-20: ANNUAL WIRE ASSOCIATION CONVENTION, La Salle Hotel, Chicago, Ill. Plant visit, technical sessions, annual luncheon, stag smoker-dinner, business meeting of members.

Complete details will be announced in Wire and Wire Products

RICHARD E. BROWN, *Executive Secretary*

300 MAIN STREET STAMFORD, CONN.

HE has had extensive experience in the selection, design and maintenance of gas fired, oil fired, and electric industrial furnaces and is now available for consultation on development, sales and service problems.

★ ★ ★

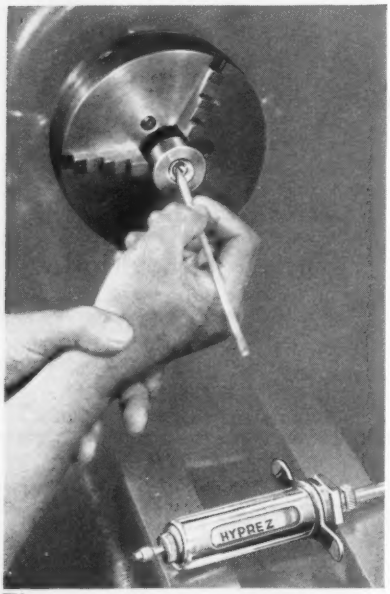
MR. GRINER is a member of The American Society for Metals and the American Instrument Society.

★ ★ ★

National Screw & Mfg. Co. Appointments

NATIONAL SCREW & MFG. CO., Cleveland, announces the following promotions: **Ben H. Jones** has been appointed vice president in charge of sales, **Donn D. Greenshields,** vice president in charge of production; and **George F. Jenkins** has been made manager of industrial sales of the company.

★ ★ ★



T-C WIRE DIES

Polished to Perfection Quickly and Economically with

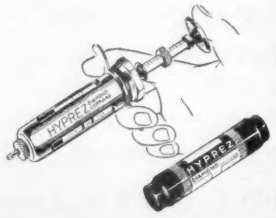
HYPREZ DIAMOND COMPOUNDS

Hyprez Diamond Compounds are formulated of precision-graded, fast-cutting virgin diamond powder in a patented base that will not fly off tool or die and which is stable and uniform at all normal temperatures.

Hyprez is a scientifically balanced product to match your finishing skill—dependably producing a uniform finish.

Hyprez is available in 24 engineered standards, fully color-identified —supplied in dust-proof cartridges and sturdy applicators to eliminate waste.

We will gladly recommend and demonstrate the proper grades for your specific work.



HYPREZ DIVISION
ENGIS EQUIPMENT COMPANY
431 SOUTH DEARBORN STREET • CHICAGO 5, ILLINOIS, U.S.A.

Anaconda Wire & Cable Co. Announces Appointments

ANACONDA WIRE & CABLE CO., New York, announces the following appointments: **L. F. Hickernell** as chief engineer, to direct the engineering and research policy of the company and act as consultant to customers as well as executive and manufacturing departments of the company. He will be aided by **L. L. Carter** and **D. E. Allen** as assistant chief engineers, both located at Hastings-on-Hudson, N. Y., engineering headquarters. **A. A. Jones,** appointed manager engineering department, will be in direct supervision of the engineering and research operations.

★ ★ ★

H. Edgar Lewis

H. EDGAR LEWIS, 66, retired president and chairman of the board, **Jones & Laughlin Steel Corp., Pittsburgh,** died of pneumonia Dec. 5. He resigned his positions with the company two years ago, because of failing health. Mr. Lewis was made executive vice president of Bethlehem Steel Co. in 1916, and in 1930 left that company to become chairman of the executive committee of Jeffrey Mfg. Co., Columbus, O. He was elected chairman of the board of directors, a director and a member of the executive committee of Jones & Laughlin Steel Corp. in 1936, and president of that corporation in 1938.

★ ★ ★

Raymond W. Cook

RAYMOND W. COOK, 58, executive vice president, **Associated Spring Corp.,** Bristol, Conn., died Dec. 4. He became associated with the Wallace Barnes Division of Bristol at an early age, and during 40 years of service with the company worked in many capacities. In 1941 he was elected a director of Associated Spring Corp., and executive vice president in 1944.

★ ★ ★

Braster Joins Niles Steel Products Division

ANNOUNCEMENT has been made of the appointment of **W. A. Braster** as Manager of Cable Reels and Spools for the **Niles Steel Products Division** of the **Republic Steel Corporation** at Niles, Ohio. The appointment took effect as of January 1, 1949, at which time Mr. Braster also became a member of the Wire Association. On behalf of the membership, Mr. Braster is cordially welcomed to our organization and extended our best wishes for his success.

★ ★ ★

Hunter Spring Inspection Course Opened to Wire Suppliers

SO great has been the interest in the weekly-two-day course on modern statistical techniques of Quality Control and Inspection conducted by **Hunter Spring Company,** Lansdale, Pa.—41 major companies having sent 145 inspectors, engineers, purchasing agents, metallurgists, production foremen, and shop superintendents to receive instruction since the course was opened in April—that Hunter is now opening the course to its wire suppliers and others not directly involved in the purchase and use of precision springs.

★ ★ ★

ON Tuesday and Wednesday, October 26 and 27, the course was given to research engineers and metallurgists from Allegheny Ludlum Steel Corp., Armco Steel Corp. (Rustless Division), Johnson Steel & Wire Co., Inc., Chase Brass & Copper Co., John A. Roebling's Sons Co., New England High Carbon Wire Co.

★ ★ ★

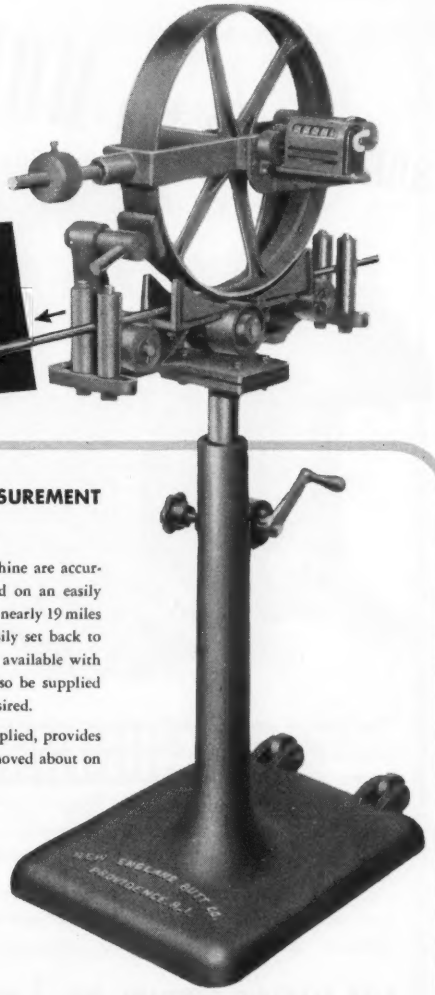
THE curriculum needed to be only slightly modified for this class. The course embraces the following topics: the use of the frequency-distribution curve and the correlation charge in inspection for analysis of production troubles; production control charts; out-going sampling techniques; quality reports; types of defects; sampling; 100% testing; load-testing of springs; pressureless measurement of flexible parts; gauging; supplier reports; lot-to-lot variation; non-normal distribution; spring specifications and their interpretation; electronic instrumentation; standard forms and reporting techniques; and the use of the standard f-d curve.

★ ★ ★

MAKE USE OF YOUR BUYERS GUIDE. It is a convenient reference on sources of all kinds of wire, machinery, equipment and supplies used by wire men. And mention the book when writing to concerns listed.

NEBUTTCO

WIRE MEASURING MACHINES



FOR QUICK, ACCURATE MEASUREMENT OF WIRES OR CABLES . . .

Wires or cables passing through this machine are accurately measured and their lengths recorded on an easily read counter. Lengths up to 100,000 feet . . . nearly 19 miles . . . can be registered. Counter can be easily set back to zero at the start of a run. Machine is also available with counter mounted on right side. It can also be supplied with electric predetermined counter if desired.

Heavy cast iron standard, optionally supplied, provides firm support for machine, may be easily moved about on its rollers and adjusted to proper height by the rack and pinion. Machine illustrated is made in two sizes — No. 1 for measuring wires to $\frac{5}{8}$" diameter and No. 2 for wires to $1\frac{1}{2}$". We also manufacture a small bench type machine for measuring any flexible material not over $\frac{5}{16}$" diameter.

For complete specifications ask for Circular No. 1

NEW ENGLAND BUTT COMPANY

Established 1842

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JAMES DAY (MACHINERY) LTD., "FORD HOUSE", 88 REGENT ST., LONDON, W. 1, ENGLAND

A Review of Recent Wire Patents

NO. 2,455,355, METHOD OF MAKING SPHERICAL COILS FOR VARIOMETERS, patented December 7, 1948 by Edward E. Combs, Long Branch, N. J.

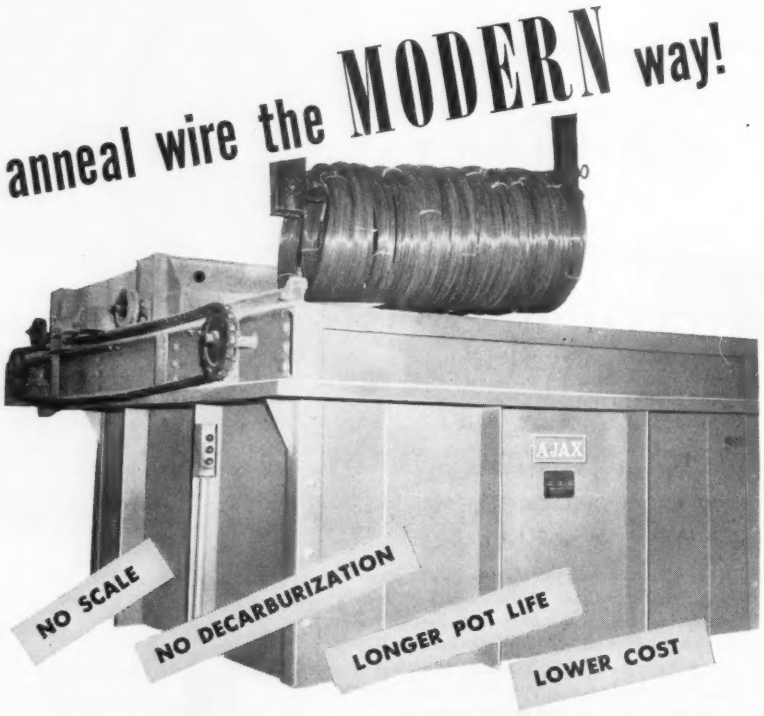
After the wire is wound into a hollow sphere about a spherical form, the wire is held against unwinding, then the hollow sphere is cut into two approximately equal parts and these are placed about a spherical coil frame, and the cut wire ends joined.

★ ★ ★

NO. 2,455,377, WIRE-WINDING DEVICE, patented December 7, 1948 by Chauncey N. Maggiacomo, United States Army, Poughkeepsie, N. Y.

This apparatus for recovering field wire, comprises a pair of rotatable reels mounted on a frame, an upper roller and a lower roller carried by the frame for tensioning wire passing to the reels, a device for manually traversing the winding of the wire from one end of a reel to the other, a post on the frame, a cross arm at the upper end of the post, and swivelly mounted pulleys one at each end of the cross arm to guide wire to the rollers.

★ ★ ★



You'll save money, you'll improve efficiency along many lines with the unique Ajax Electric Salt Bath wire annealing method. It requires less floor space, less labor, less maintenance. Heating cycles average less than 20 minutes, even on difficult jobs. There is no scaling, no decarburization, no explosion hazard, none of the bothersome problems entailed with atmosphere equipment. Salt bath treating does the work faster, better, cheaper!

Ideal for annealing low- or high-carbon and stainless steel wire and rod; annealing aluminum, and copper and silver alloys; and for descaling stainless and alloy steel wire in molten salt baths.

AJAX ELECTRIC COMPANY, INC.
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The World's Largest Manufacturer of Electric Heat Treating Furnaces Exclusively

WRITE FOR YOUR COPY!
This 72-page Ajax booklet tells the entire story of salt bath heat treatment as applied throughout modern industry. Ask for Booklet 116.

AJAX HULTGREN ELECTRIC SALT BATH FURNACE

NO. 2,455,499, APPLICATOR FOR APPLYING INSULATION TO WIRE, patented December 7, 1948 by Philip V. Kessler, Phillipsdale, and John B. Moss, Providence, R. I., assignors to Kennecott Wire and Cable Company, Phillipsdale, R. I., a corporation of Rhode Island.

Viscous insulating material is applied to wire in one or more coatings.

★ ★ ★

NO. 2,455,773, ELECTRIC CABLE, patented December 7, 1948 by Richard A. Johnson, Marion, Ind., assignor to Anaconda Wire and Cable Company, a corporation of Delaware.

The cable comprises two individually-jacketed wire conductors, a rubber sheath enclosing the jacketed conductors, and a breaker strip comprising a strip of rubber faced on each side with a layer of fibrous material extending the length of the cable between the jacketed conductors, the edges of this breaker strip extending into contact with and being firmly bonded to the rubber sheath.

★ ★ ★

NO. 2,455,863, SPRING COILING MACHINE EMBODYING A CHANGE SPEED MECHANISM, patented December 7, 1948 by Elmer W. Halvorsen, Worcester, Mass., assignor to The Torrington, Manufacturing Company, Torrington, Conn., a corporation of Connecticut.

Said to be applicable to the spring coiling machine disclosed in U. S. Patent 2,119,002 issued May 31, 1933, the mechanism is adapted to operate and control the shaft which actuates the feed rollers and the cam shaft which times the cycle and actuates the cut-off mechanism.

★ ★ ★

NO. 2,456,015, ELECTRICAL CONDUCTOR, patented December 14, 1948 by Keith L. Orser, Auburn, N. Y., assignor to Columbian Rope Company, Auburn, N. Y., a corporation of New York.

More particularly, the invention relates to wire conductors for use in load-sustaining structures, such as ropes (i.e., to provide a telephone circuit in connection with the handling of the ropes).

★ ★ ★

NO. 2,456,223, APPARATUS FOR FORMING TERMINAL ENDS OF COILS, patented December 14, 1948 by John S. Stull, Chicago, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

A bending apparatus is provided for bending the tangential end of a wire coil.

★ ★ ★

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

NO. 2,456,353, WIRE-BENDING MACHINE, patented December 14, 1948 by John L. Wolf, Bloomsburg, and William C. Wolf, York, Pa.

This machine is for forming straight wire or strip material into sinuous shape to provide a wire ribbon having spaced transverse flights the ends of each of which are connected respectively to the adjacent ends of the preceding and succeeding flights.

★ ★ ★

NO. 2,456,407, MACHINE FOR PRODUCING SCREW THREADS, patented December 14, 1948 by Arthur Green, Coventry, England.

The machine simultaneously produces screw threads at both ends of the work.

★ ★ ★

NO. 2,456,704, APPARATUS FOR TESTING AND MARKING INSULATED CONDUCTORS. patented December 21, 1948 by George E. Henning, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

More specifically a tape-applicator is provided which comprises a device for holding a pad of adhesive tape, a second device for pressing against the insulated conductor an end of the adhesive tape, means for moving the tape-pressing means away from the insulated conductor a predetermined period of time after the tape-pressing device is actuated, and a device for severing the tape when the tape-pressing device is moved away from the insulated conductor.

★ ★ ★

NO. 2,456,947, CORROSION RESISTANT COATING FOR METAL SURFACES, patented December 21, 1948 by George W. Jernstedt, Belleville, N. J., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania.

For initially activating the surface of iron, zinc or cadmium and their alloys for subsequent reaction with phosphate coating solutions the inventor provides at least 0.01% by weight of disodium phosphate combined with at least one water-soluble compound of titanium, zirconium, tin or arsenic, at least 0.01% of a soap of a fatty acid and an amine and the balance being water.

★ ★ ★

NO. 2,457,402, WIRE-STRANDING MACHINE, patented December 28, 1948 by Arthur J. Roetting, New Haven, Conn., assignor to Wire Machinery Corporation of America, Inc., New Haven, Conn., a corporation of Connecticut.

This machine comprises a stand, a flyer rotatably mounted therein, this flyer comprising spaced trunnions, and carriers connecting the trunnions, each of the carriers comprising a flexible metallic cable connected at its ends to the trunnions, this cable being longer than the distance between the trunnions and arched between the trunnions.

★ ★ ★

NO. 2,457,436, HIGH-TENSION ELECTRIC CABLE, patented December 28, 1948 by Charles E. Bennett, Ridgewood, N. J., assignor to The Okonite-Callender Cable Company, Incorporated, Paterson, N. J., a corporation of New Jersey.

About the assembly of insulated (oil permeable tape) wire conductors and oil permeable fillers (to build up the desired cross section) is a tight-fitting metal sheath, extruded about the assembly, enclosing a tubular oil distributing conduit, being in the form of a flexible open helix and cabled with the conductors. Means is provided for maintaining the cable under superatmospheric pressure under all conditions of cable operation, comprising a mixture of oil and dichloro difluoromethane under superatmospheric pressure filling the conduit and the spaces between the overlapping tape wraps of the conductors and permeating and filling the voids and interstices of the fillers.

★ ★ ★

NO. 2,457,475, METHOD OF AND DEVICE FOR WRAPPING WIRE ON TERMINALS, patented December 28, 1948 by Fleming W. Johnson, Detroit, Mich., assignor to International Detrola Corporation, Detroit, Mich., a corporation of Indiana.

Wire is wrapped and secured to terminals by means of an open-ended hollow member having an apertured peripheral wall.

★ ★ ★

NO. 2,457,515, INSULATING COATING COMPOSITIONS AND METHOD OF MAKING, patented December 28, 1948 by John T. Acker, Queens Village, N. Y., assignor to Bell Telephone

(*Please turn to page* 186)

YOUR COMPLETE CARBIDE
REQUIREMENTS
FROM **ONE** SOURCE

DIES

Large stock of rough cored dies. Rough and Semi-finished mandrel nibs, Heading & Extrusion dies, Knives and Quills, Wear Parts and miscellaneous Carbide items can be furnished promptly to your specifications.

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Safe Crossings on Fab-Weld Bridge Plates

FAB-WELD Bridge Plates are made for safe and economic bridging of the gap between platform and freight car.

★ ★ ★

THEY are fabricated of safety tread floor plate with side curb protection to prevent accidents and crowned to take care of different levels up to 6″ between platform and car. Collapsible lifting handles for fork truck operation make it easy and economical to place into position and simple to transport. Positive locking device and wide range of adjustment assures absolute safety. Heavy side curbs and center reinforcing designed to take heavy loads without strain.

★ ★ ★

MADE in load capacity of 15,000 lbs. with platform and lengths 65″ to 92″ in widths of 29¼ to 59½ with span of 5″ to 46″.

★ ★ ★

TWO shapes are furnished: rectangular, where entry of the car is on a straight line or in flare shape, which permits any direction of entry into the car from the loading platform. The manufacturer, **Fab-Weld Corp.**, Pickwick and Richmond Sts., Philadelphia 34, Pa., will be glad to send details on request.

★ ★ ★

New Room Temperature Strippers for Organic Finishes

ENTHONE, INC., 442 Elm Street, Dept. WWP, New Haven, Conn., has announced the development of two new room temperature strippers for synthetic enamels: Strippers S-17 and S-19.

★ ★ ★

STRIPPER S-17 is stated to be a clear, quick-evaporating stripper used at room temperature for removal of all types of synthetic enamels, including heavy coatings of enamels that accumulate on work holders and hooks. For such cases, the various layers of enamel exfoliate, leaving the work holders clean. Stripper S-17 is particularly recommended for the removal of clear synthetic enamels from highly polished surfaces, such as brass, gold plate and silver. It does not tarnish metals and it has no significant odor.

★ ★ ★

THE other stripper, S-19, is similar to S-17 in its action and appearance except it is slightly ammoniacal in composition and is used in certain special cases for removal of synthetic enamels where the S-17 is not satisfactory. Both strippers are used with water seals to minimize evaporating losses, and rinsing is not necessary after the use of these strippers.

★ ★ ★

THE work to be stripped is merely immersed in the strippers at room temperature. After a few seconds to several minutes, the enamel is completely removed from the surface of the metal and the parts can be removed. The stripper evaporates quickly and the part is ready for refinishing.

★ ★ ★

CHEMICALS ACP PROCESSES

IMPROVE PICKLING

MINIMIZE EMBRITTLEMENT

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TRADE MARK

RODINE

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RUST PROOFING AND PAINT BONDING

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PICKLING ACID INHIBITORS

Rodine * ®

A grade of "Rodine" is available to more completely prevent embrittling wire and other products in pickling. It does the same thorough inhibiting job so long and so generally associated with "Rodine" and efficient pickling.

Now, more than ever, it is cheaper to pickle with than without "Rodine".

For further details, write us at Ambler, or talk with the "Rodine" consultant who calls upon you.

Descriptive folders available on request.

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AMERICAN CHEMICAL PAINT COMPANY

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Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

New Technical Publication on DC 200 Silicone Fluids

A NEW booklet, said to be the most comprehensive body of information available on the properties and behavior of the DC 200 Silicone Fluids, has been published by the **Dow Corning Corporation,** Midland, Mich. These semi-inorganic fluids are notable for their heat stability, shear resistance, relatively constant viscosity over a wide temperature range, lubricity, water repellency and good dielectric properties. Their usefulness as damping and hydraulic media, as liquid dielectrics, as special purpose lubricants or as additives, impregnants or coatings has been established in almost every field of industry.

★ ★ ★

AFTER more than five years of experience in producing and helping to adapt DC 200 Fluids to a wide variety of uses, we are convinced that the potential usefulness of these liquid silicones will not be fully realized for many years to come. Progress in that direction will depend upon the dissemination of such data as we have compiled in the tables, graphs, and text of this booklet. This publication will be of considerable interest to many of its readers.

★ ★ ★

New Folder Describes Water-Hydraulic High Pressure Controls

FOLDER U L-43, with many illustrations descriptive of Water-Hydraulic High Pressure Controls, has been issued by **Hydropress, Inc.,** specialists in Heavy Hydraulic Machinery, 570 Lexington Avenue, New York. The bulletin deals with Hydraulic Control Valves, Prefilling Valves, Stop Valves, Check Valves, By-Pass Valves, Shut-off Valves for Hydraulic Accumulators and combinations of valves for sequence operation. Hydropress valves are the development of many years of hydraulic engineering experience and have been used in numerous Hydraulic Plants built or modernized by Hydropress, Inc.

★ ★ ★

New Bulletin on Dillon Model "L" Tester

A FOUR-PAGE Bulletin just off the press, brings valuable and practicable information to testers of virtually any type of material from fabrics to strong metals used in industrial production. It does much more than illustrate and describe the portable Dillon Model "L" Universal Tester—a precision instrument of seven different ranges, widely used in industrial plants, universities and laboratories, for testing materials of tensile strength from a few pounds to 160,000 pounds, p.s.i.; it shows by clear photographs the simple construction for tensile, compression, transverse and shear testing; describes the handling of flats and rounds—fixtures for fabrics, cord, rope, wire, wood, and adhesives—illustrates the clear easily read dynamometers interchangeable for all capacities. Copies of the Bulletin may be had by addressing the manufacturer, **W. C. Dillon & Co., Inc.,** 5410 W. Harrison St., Chicago 44, Ill.

★ ★ ★

"Any Lily-Gilding Today?"

A MANUFACTURER recently brought this interesting production problem to Fine Wire Headquarters.

He wanted his product to have high strength and springiness, low contact potential and good conductivity. Our recommendation was to first make the product of .020 phosphor bronze wire, in order to get the strength and resilience characteristics.

Low contact potential and good conductivity were then obtained by following our suggestion to gold plate the phosphor bronze wire. "Gilding the lily" in this case cost less than $5.00 per pound to the manufacturer's pleased surprise.

★ ★ ★ ★

North American Philips specializes in drawing, enameling, and plating extremely fine wires in practically all metals and alloys. For example: Tungsten Wire as fine as .00028 has been gold plated.

So, when you have a problem on Fine Wire, Tungsten, or Molybdenum, why not call on Fine Wire Headquarters—phone, wire, or write to North American Philips, makers of NORELCO Fine Wires and ELMET Tungsten and Molybdenum products.

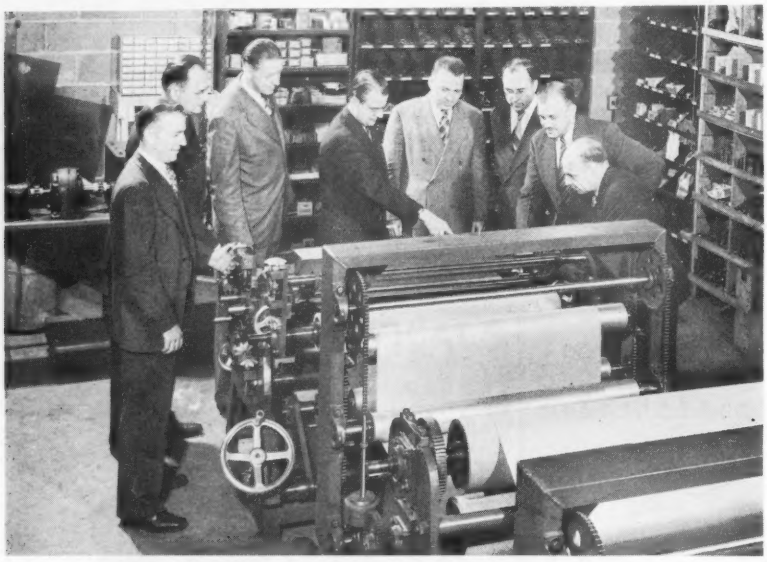
NORTH AMERICAN PHILIPS COMPANY, INC.

Dept. XY-Z, 100 East 42nd Street, New York 17, N. Y.

Export Representative • Philips Export Corporation • 100 East 42nd Street, New York 17, N. Y.

Newly Designed Machine for Coating Paper, Textiles, Film and Foil by Industrial Ovens, Inc.,

DISTRICT Engineers attending a sales engineering conference of **Industrial Ovens, Inc.,** at Cleveland, October 12-14, are shown inspecting one of the Company's newly designed machines for coating paper, textiles, film and foil. Pointing out some of the exclusive features of the new equipment is **C. A. Litzler,** President. Others in the picture are (left to right): A. H. Kruger, District Engineer, Chicago; J. R. Hall, General Manager, Cleveland; V. C. Leatherby, District Engineer, Pittsburgh; J. K. Gillett, Sales Engineer, Cleveland; J. P. Clark, Jr., District Engineer, Philadelphia; R. B. Symons, New England, District Engineer, Tiverton, R. I.; and E. V. Larson, District Engineer, Toronto, Canada.



"Inspecting the Industrial Ovens, Inc., New Coating Machine at a Recent Sales Conference at Cleveland, Ohio."

* * *

New Transformer Catalog

IN an attractive presentation the **Eisler Engineering Co., Inc.,** Newark, New Jersey, has just issued a new 26 page Transformer Catalog, #TR-49, with over 135 illustrations covering in systematical arrangement the development and results of 28 years of management and specialized engineering experience in the design and manu-

ANNOUNCING the 1949 EDITION of the Wire and Wire Products BUYERS GUIDE and YEAR BOOK of the WIRE ASSOCIATION

The new and revised 1949 Edition of this very useful BUYERS GUIDE will be ready for distribution on or about April 1st, 1949.

Subscribers to WIRE AND WIRE PRODUCTS may secure the directory at a discount of 40%. Send your order now for the BUYERS GUIDE with your check for $3.00, or send the order and we will bill you on publication in April.

To non-subscribers, the price remains $5.00 per copy.

The BUYERS GUIDE contains 30,000 listings of all kinds of wire and wire products manufactured in the United States and lists, in addition, the manufacturers of machinery, equipment, supplies and services that are available to the wire industry.

It is an important and authoritative source of information on everything of interest to wire men. You should have it. You need it in the conduct of your business.

Members of the WIRE ASSOCIATION receive a copy of the BUYERS GUIDE as a part of the service of the Association to them, without extra charge.

ORDER YOUR COPY TODAY

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WIRE AND WIRE PRODUCTS

300 MAIN STREET STAMFORD, CONN.

facture of Transformers from ¼ up to 400 KVA and potentials up to 15,000 volts, for every class of service.

★ ★ ★

SECTIONS of the contents include: Construction features and steps in the manufacture of Eisler single and three phase Oil-Immersed, Self-Cooled, as well as Eisler Dry-Type, Air-Cooled Distribution Transformers for Lighting and Power, built in strict adherance to N.E.M.A., A.S.A., and A.I.E.E. standards, with numerous on-the-job pictures, close-up views, comprehensive text, technical data, and electrical specifications; informative photographs of the company's engineering facilities, as the modern metal fabricating department with the new Automatic Arc Welding Machine for transformer tanks, Winding and Testing department.

★ ★ ★

EXEMPLIFIED in numerous pictures and diversified applications are further the general purpose Specialty Transformers for Heating, Welding, Soldering, Phase-Changing, Auto, Testing, etc., and special transformer types of Electronic devices, for Neon Sign making, for the Radio Tube industry.

★ ★ ★

THE catalog is freely available upon request on letterhead.

★ ★ ★

New Tough Enamel Developed

ALREADY taking the place of expensive cadmium - plated steel in several industrial finishing operations, **Standard Super Aluminum Baking Enamel,** a new metal-hard finish has been introduced to the industry by **The Industrial Division of Standard Varnish Works,** New York and Chicago, a company statement announced recently.

★ ★ ★

"THE long mileage and marvelous abrasion - resistance of this new protective coating is superior, our tests show, to that of any similar finish—and many expensive metals—now available to the processing industry," said the

If it's twisted folded pressed crushed shaped braided woven paper

TWITCHELL makes it

fine, treated yarns wound 4 ends parallel for high-speed wrapping by new Abbo-sealed process will be available soon.

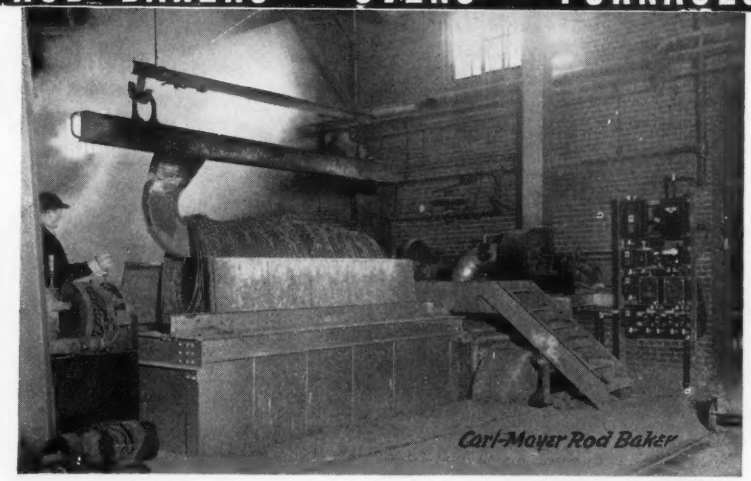
waxed cable-filler for 2- and 3-wire non-metallic sheath cable and ship-board cable.

wire-rope cores

braiding and wrapping yarns for electrical cable.

E. W. TWITCHELL INC.
Third & Somerset Streets,
Philadelphia 33, Pa.

MORE PRODUCTION with CARL-MAYER HI-SPEED ROD BAKERS - OVENS - FURNACES



Patented
TYPICAL HI-SPEED ROD BAKER — DIRECT OR INDIRECT HEAT — ANY FUEL
WRITE for BULLETIN No. 241
Growing interest in our type of equipment is evidenced by Carl-Mayer installations for such plants as:—

American Steel & Wire Co.
Atlantic Wire Co.
Atlas Steel Co.
Atlas Tack Corp.
California Wire Cloth Corp.
Eaton Mfg. Co.
Frost Steel & Wire Co. Ltd.
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Johnson & Nephew Ltd.
Jones & Laughlin Steel Corp.
Pittsburgh Tool Steel Wire Co.
Republic Steel Corp.
Steel Co. of Canada
Wickwire Spencer Steel Div.
Page Steel & Wire Co.

THE CARL-MAYER CORPORATION
3030 EUCLID AVENUE
CLEVELAND, OHIO

EXTRUDERS

THAT OFFER MORE

WIRE COVERING

CAPACITY

mpm

MPM offers six-zone control of electrically heated cylinders with nine-eleven or fifteen separate cooling zones for removal of frictional heat or for fast cooling. Higher temperatures—higher screw speeds—higher production—per machine.

FLEXIBILITY - Operating Economy

These MODERN machines are furnished electrically heated but can be heated or cooled by steam, oil, water, etc. Interchangeable heads and dies to produce covered wire, tubing, rods, strips, wide sheeting are also available along with conveyors, granulators, dryers, etc.

FAST DIE OR SCREEN CHANGES

Modern engineering and specialization has resulted in the installation of these machines with 18 of a possible 20 leading material suppliers during the past two years. More complete cooperation with foreign customers too has made MPM the largest exporters of Extruding equipment during the same period.

modern plastic machinery corp. mpm

GREATER *Flexibility* = MORE PROFITS!

SEND FOR BROCHURE

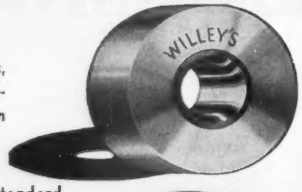
15 UNION ST., LODI, N. J.

CABLE ADDRESS MODPLASEX

WILLEY'S DIES LAST MUCH LONGER

SPECIFY WILLEY'S SIZING, EXTRUSION and WIRE DRAWING DIES

Pioneers in the manufacture of wire forming dies, Willey's is in position to make dies to your specifications that give superior performance, cut production costs and hold tolerances for long runs.



There are standard one-piece round dies, available from stock in many sizes — as well as four classifications from blank and rough cored nibs to finished dies, ready to use.

WRITE FOR CATALOG

Full information on all sizes and classifications, as well as hundreds of Willey's Tools for other uses.

WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

1342 W. Vernor Highway Detroit 1, Michigan

statement issued by Mr. M. H. Corbin, Standard's Vice President in Charge of Sales.

★ ★ ★

"SUPER ALUMINUM BAKING ENAMEL is now in use by the makers of tracks for metal filing cabinets and it is doing the job formerly done by high-cost cadmium-plated steel."

★ ★ ★

DEVELOPMENT of the new Standard finish has been the result of exhaustive tests that were made to meet Underwriters' specifications for a conduit box project. In the conduit box testing it became apparent that **Super Aluminum** possessed abrasion resistance in a hitherto unapproached degree. It was this abrasion resistance, coupled with the new coating's fine performance in all types of atmospheric tests which led to Standard's decision to market the product for other industrial uses.

★ ★ ★

AN interesting property of **Super Aluminum Baking Enamel,** the Standard statement concluded, "is its refusal to rub off under normal hand abrasion. This is in contrast to the high degree of smudging in most other metallic finishes."

★ ★ ★

SUPER ALUMINUM BAKING ENAMEL is recommended for either **dip** or **spray** application to bed springs, filing cabinet drawers, electrical fixtures, and all metal surfaces which are subjected to metal-to-metal abrasion.

★ ★ ★

FURTHER information may be obtained from The Industrial Division, Standard Varnish Works, Dept. W, 2600 Richmond Terrace, Staten Island 3, New York.

★ ★ ★

A. S. & W. Establishes Stainless Sales Division

ESTABLISHMENT of a separate stainless steel sales division, as part of the company's intensified effort in the field of stainless steel wire, bars and strip, was announced

recently by the **American Steel & Wire Co.**

★ ★ ★

BANKS E. EUDY, a pioneer in this field, was named as manager of the new division, to be known as the Stainless Steel Products Sales Division. Appointed as assistant manager was **C. Richard Horwedel,** another authority on stainless and other high alloy metals. Together the two have a combined record of 44 years of service in stainless steel manufacture and merchandising.

★ ★ ★

STAINLESS steel is a specialized product that is being used in a growing list of important products. Stainless wire is used for electrodes, for refrigerator shelving, dish washing machine baskets, lashing wire for the telephone industry, and numerous applications in the heading industry—such as for screws and bolts in metal furniture, automobiles, and many other lines.

★ ★ ★

AMERICAN STEEL & WIRE recently placed in operation an entirely new stainless mill at Waukegan, Ill., where the company's production of stainless steel wire of all gauges will be concentrated. Operations were started there in October and now are headed toward full production. Stainless steel wire formerly was produced in Cleveland.

★ ★ ★

Booklet on Stainless Steels

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Whitehall St., New York 5, N. Y., has published a 28-page reproduction of the first three chapters of a book entitled "Forming of Austenitic Chromium-Nickel Stainless Steels."

★ ★ ★

THE chapters cover mechanical properties, forming characteristics, and processing after forming, and embody much useful information for those who work this alloy.

★ ★ ★

A COPY of the booklet will be mailed to those who would like to have it.

★ ★ ★

NEW — AND BETTER

PATENTING
TEMPERING
ANNEALING

The *Trauwood* PROCESS

OUTSTANDING ADVANTAGES

Higher and more uniform physical and fatigue properties.

No surface decarburization or scale.

Faster wire speeds . . . greater production.

Equipment fully automatic and easy to operate.

Control of heating and cooling cycles extremely accurate.

Thermal efficiency of the process very high.

Much finer grained structure possible.

High quenching temperatures rapidly attained.

Adaptable to high alloy and austenitic steel wire and strip (annealing of stainless).

The Trauwood Process, new in principle, eliminates high temperature furnaces and lead pots with their excessive maintenance costs and low thermal efficiencies. More positive temperature control is possible and quenching is done in a RISING temperature—instead of falling, as in conventional heat treating methods. The rapid rate of heating (4 to 5 times as fast as furnace heating) increases production and uniformly produces a finer grained product with higher physical and fatigue values.

Wire and rod patented by the Trauwood Process insures easier drafting and makes heavier reductions possible. In conjunction with the Trauwood patenting equipment, pickling, coating and baking can be made continuous, eliminating expensive handling and delay, materially reducing costs as compared with ordinary methods.

Complete details of the Trauwood Process will be furnished you on request. Our engineers will help you solve your continuous wire and strip patenting, tempering, and annealing problems. Write today.

THE TRAUWOOD ENGINEERING COMPANY

15200 BROOK PARK RD., Box 2719, Westpark Station, CLEVELAND, OHIO

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JOHN RIGBY & SONS, LTD., LOW MOOR, BRADFORD—YORKS, ENGLAND

***Sjogren* . . . PULLERS**

A PINCER TYPE PULLER, for use on the older frames, that is properly designed for the work and with jaws that insure a non-slip grip. Four stock sizes are available for a wide variety of work. S & S Pullers are made with replaceable jaws that are also carried in stock. S & S jaws are especially machined on the back to prevent looseness in the holder and which eliminates all strain on the attaching screw.

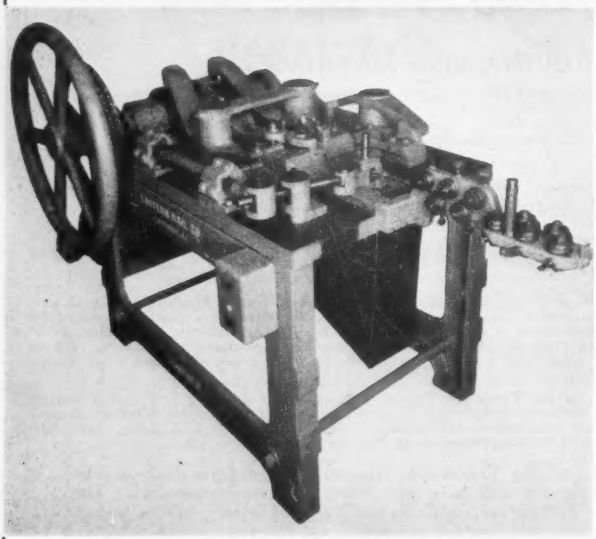
Used by Wire Men Who Want the Best!

SJOGREN TOOL AND MACHINE CO., INC.

WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • CAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS •

14 SWORD STREET
AUBURN
MASSACHUSETTS

PROMPT DELIVERIES ON
"ENCO"
WIRE NAIL MACHINES



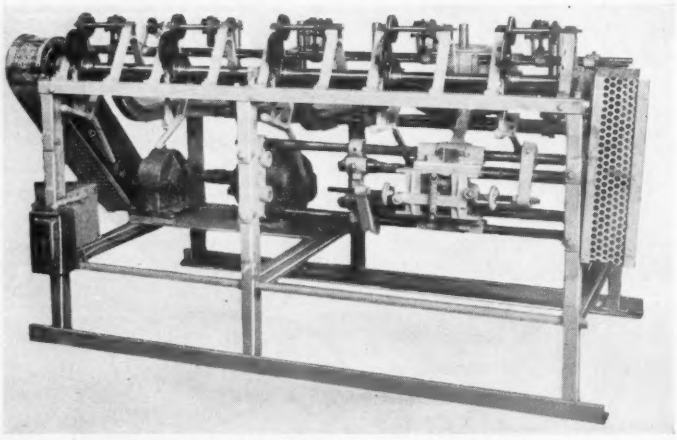
Easy To Set Up And Operate.

Furnished belt drive or with motor including V belts, starter, etc.

No. 2 size will cut 180 lbs. per hour of 8d common or 12 kegs per 8 hr. day running 300 R.P.M.

Write for prices, stating size and number of machines wanted.

EASTERN NAIL COMPANY
50 ALEPPO STREET • PROVIDENCE 9, R. I.



No. 300 MULTIPLE SPINDLE SPOOLER

This machine spools fine wire from .005 to .030 diameter and has a spool flange capacity of 7". Wire tension and traverse adjustments are easily made, and spindles can be started or stopped individually. Any desired lay of wire is easily obtained by a simple change of gears. Non friction bearings used throughout.

All Emory spoolers may be adapted to customer's operating conditions.

On Spooling problems consult

ROBERT J. EMORY COMPANY
31 EAST RUNYON STREET NEWARK 5, NEW JERSEY

Platform and Warehouse Trucks

ALL steel platform made up of heavy gauge formed sections completely welded into a structurally strong chassis mounted on roller bearing wheels and swivel casters are available through the **Fab-Weld Corp.,** Pickwick and Richmond Sts., Philadelphia 34, Pa. These are equipped with end racks, either angle or pipe, and furnished with balanced type running gear or non-tilt gear. Features are

Quiet operation and ease in rolling;
Standard platform sizes from 24 x 48 to 48" x 96";
Capacities from 1000 lbs. to 4000 lbs.; and
Rubber tire, plastic or semi-steel wheels.

★ ★ ★

DETAILS and prices will be furnished by the manufacturer upon request.

★ ★ ★

Handy Dispenser Carton Features New Line of Precision Music Wire

CARTONED in a newly designed dispenser-type box, a complete line of music wire has been added to the family of products packaged by the Manufacturing Division of **Precision Steel Warehouse, Inc.,** Chicago, Ill.

★ ★ ★

THE new style cello-wrapped carton, believed to be the first of its kind, eliminates the previous trouble, inconvenience and wastage of handling "bulk" coils of music wire by holding the tension-coiled wire firmly in position to prevent it from uncoiling and getting out of control. Ingenious design provides for removal of the center of the carton, thus permitting any desired length of wire to be unrolled smoothly from the **inside** of the coil and snipped off. The free end of the wire remaining in the carton is then hooked into one of four slots which are die cut into the center opening; this holds the wire in an easily accessible position for quick, convenient use at any time.

★ ★ ★

THIS method of packaging retains the oiled wire in an even coil, protected from excessive han-

dling, and prevented from twisting and damage due to sudden accidental uncoiling.

★ ★ ★

A COMPLETE selection of sizes is included in the new Precision Brand line of music wire from a diameter of .004 to .180. Each size is available in ¼ lb., ½ lb. and 1 lb. cartons. The product itself is made of first quality electric furnace steel, cold drawn with micrometer precision conforming to U. S. government accuracy standards. Warranted as to uniformity, Precision Brand Music Wire has proven its ability to fulfill the exacting requirements encountered in making various types of mechanical springs, wire forms, gauges, punches, costume jewelry, dental and medical tools and similar precision parts and instruments.

★ ★ ★

FOR additional information, write for Bulletin No. 310 on Precision Brand Music Wire, Precision Steel Warehouse, Inc., 4409 West Kinzie St., Chicago 24, Illinois.

★ ★ ★

Leaflet on New Porter Cutters

THE new triplets—born at the same time and built on the same lines carry the family name "HandKliP." One is a shear cutter—(cuts steel strapping, wire stay & box wire). Another is a wire cutter (for cutting soft wires, rods, and ¼ inch bolts). The third one is an angle cutter (for close cutting of Cotter pins, rods, bolts, etc.). All three tools have the same power joint principle, the same pressed steel handles covered with a red plastic, unaffected by weather or water. These three tools are really an innovation. New in design, amazingly powerful, light and compact. They will stand up under long hard usage. These tools are so different, so efficient, so reasonable in cost that it is predicted Porter HandKlip is going to go places fast. Made by the Manufacturers of famous Porter Cutters —**H. K. Porter, Inc.,** Somerville 43, Mass. Send for literature.

★ ★ ★

NORBIDE Abrasive: Effective, Economical

This abrasive—second only to the diamond in hardness and 150 times less expensive—does an efficient job of cutting and semi-finishing cemented carbide wire drawing dies.

NORTON CO. — Worcester 6, Mass.

REVOLUTIONARY New Method of

Rust Control

Outperforms other more complex, more costly "preventives". Even answers problems never before solved. CLEAN, EASY TO USE!

It Eliminates Slushing in Oil – It's . . .

Angier **VPI*** **Wrap**

PROOF: Identical steel parts exposed 9 months to industrial-marine atmosphere. These photos are unretouched.

Without VPI | Without VPI, but Slushed in Oil. | With VPI

ANGIER creped, waterproofed, reinforced papers for industrial, building and farm use. Industrial Packaging Engineers Since 1895

*Vapor Phase Inhibitor developed by SHELL MORE than a non-corrosive paper — a revolutionary packaging method of COMPLETE rust control. Get the facts now!

Angier CORPORATION FRAMINGHAM 3, MASS.

Gentlemen: Please send FREE 12 page booklet, "Complete Rust Control with Angier VPI Wrap"

Name

Address

City & State

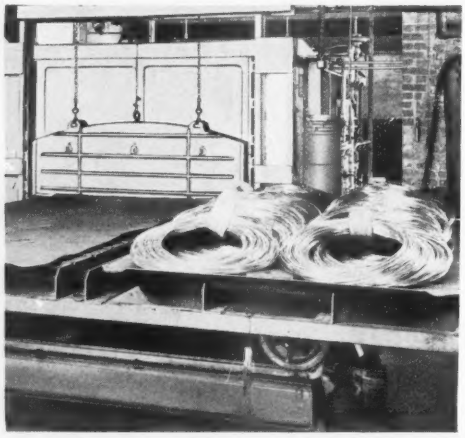
Just Off the Press!

JOHNSON XLO Music Spring Wire—makes your operations easier. Your springs and wire forms deserve the best. . . . All JOHNSON wire is strictly laboratory controlled — every pound carefully drawn . . . automatic temperature controls . . . precision made dies . . . standardized lubricants.
The wire of a thousand uses is tops in wire quality. There is a Johnson office near you. Warehouse stocks, Worcester, Chicago, Los Angeles.
JOHNSON
STEEL AND WIRE COMPANY, INC.
WORCESTER 1, MASS.
NEW YORK PHILADELPHIA CLEVELAND DETROIT AKRON CHICAGO
ATLANTA HOUSTON TULSA LOS ANGELES TORONTO

ROCKWELL FURNACES
Oil • Gas • Electric

This Rockwell annealing furnace is one of many such units installed for scale-free or clean annealing coils of wire loaded on one or more pans. In this operation 5000 lbs. of medium gauge brass wire per load is annealed at 1000°-1200° F. (as required) in an atmosphere controlled to produce an oxide-free surface. The furnace is direct gas fired. The pan loading furnace offers the advantages of uniform heat treatment and convenient handling of wire and rod in coils.

Rockwell also builds hydraulic pusher type cake, bar and billet furnaces; continuous radiant tube, belt and catenary furnaces, for strand annealing; pit, pot and hood furnaces for all wire mill heating operations and Gehnrich Ovens for low temperature heat treating and baking finishes and lime coating.



Other Rockwell Products

Coil winding machines, reels and spools; pickling, brushing, cleaning, washing, finishing, drying and handling equipment; special fabrications.

We also design non-ferrous rod mills.

Write for Bulletins

ROCKWELL SINCE 1888 BUILT
FURNACES • OVENS • SPECIAL MACHINERY
W. S. ROCKWELL COMPANY
242 ELIOT STREET • FAIRFIELD, CONN.
In Canada: Francis Hankin & Co., Ltd. Montreal & Toronto

Two New Books

THE NATIONAL FOREMEN'S INSTITUTE, INC., Deep River, Conn., has announced the availability of two books designed to help personnel managers improve employee relationships.

★ ★ ★

"HOW to Prepare an Employee's Handbook" is a 300-page, loose-leaf book containing the actual policies of several hundred companies, covering 578 subjects and giving 1700 examples. It includes information on Federal Labor Laws and Withholding Taxes. Is a tool for every executive charged with the responsibility of drafting messages to employees, preparing handbooks and imparting an understanding of company policies in a way employees can understand and accept. Price, $12.50.

★ ★ ★

"INDUSTRIAL Relations Work Kit" is an 84-page book, giving ideas on how to stimulate worker interest, how to improve production records, how to better employee morale and a host of other practical helps that are intended to improve labor relationships. It sells for $2.50.

★ ★ ★

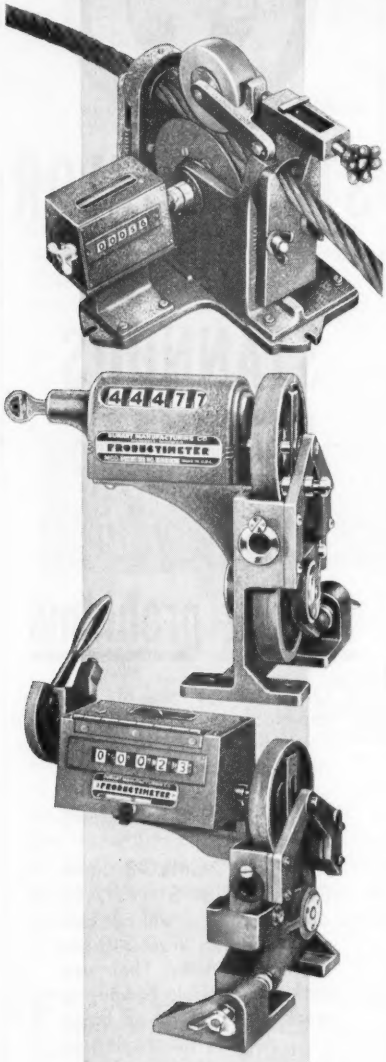
Reeves Offers New Valve for Hydraulic Controls of Variable Speed Transmission

A NEW, rotary type valve to provide maximum efficiency on hydraulic controls for Reeves Variable Speed Transmission is now available from the **Reeves Pulley Company**, Columbus, Indiana.

★ ★ ★

THE new valve is an exclusive feature of the Reeves hydraulic control which, applied to the Transmission, permits entirely automatic speed regulation for synchronization of different machines and separate sections of a single machine; maintenance of control tension and uniform peripheral winding speeds; and maintenance of uniform pressure, weight, liquid level, temperature and other variable elements.

PRODUCTIMETER
WIRE MEASURING MACHINES
Fast . . Accurate . . Dependable . . Legible



Productimeters measure all types of wire from .010 to 3½ inches in diameter . . . at speeds up to 5,000 feet per minute. They eliminate "guess-work". . . insure profitable operation in your plant.

Send for Catalog No. 40

DURANT MFG. CO.
1918 N. Buffum St. Milwaukee 1, Wis.
118 Orange St. Providence 3, R. I.
Representatives in Principal Cities

PRODUCTIMETERS
SINCE 1879 *Speedometers OF INDUSTRY*

EXTREMELY simple in design and with few moving parts to wear, the valve is actuated with only four ounces pressure. Its stem is mounted on ball bearings to assure smooth operation, with minimum friction or "drag." Because of its rotary design, eliminating lateral motion of the stem, the new valve can use to full advantage a tight-fitting, cup-type oil seal which prevents oil leakage around the valve stem.

★ ★ ★

THE new rotary type valve is being installed on all new Reeves Variable Speed Transmissions, replacing the stem-type valve previously used. It also is available for replacement on Transmissions now in service. Only two sizes of valves are required to fit all Reeves Transmissions using hydraulic controls.

★ ★ ★

WITH the new valves, their engineers point out, users of Reeves Variable Speed Transmissions can realize the full advantages of hydraulic control for their equipment.

★ ★ ★

IN addition to Variable Speed Transmissions, the Company manufactures a complete line of other speed control units which are standard equipment on more than 2,100 different production machines.

★ ★ ★

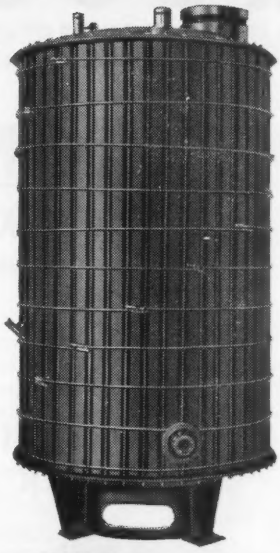
Lake Steamers Move Record Tonnage of Ore

TO the Strs. "Eugene Buffington" and "George Crawford" went the distinction of taking on the final cargoes of iron ore for the record-breaking 1948 shipping season of the Pittsburgh Steamship Co., U. S. Steel subsidiary.

★ ★ ★

THE tonnage loaded into the holds of these two vessels at Duluth early today brought to more than 25,000,000 gross tons the amount of iron ore transported down to lower lakes ports by vessels of the Pittsburgh fleet. This establishes a peace-time record for

Lick CORROSION PROBLEMS



THIS POSITIVE, ECONOMICAL WAY!

If you've ever had equipment losses due to corrosion . . . if you've ever wanted a sure, economical way to solve corrosion problems . . . investigate HAVEG.

Here is a molded structural material that assures complete acid, alkali and solvent resistance *throughout its entire mass* . . . it is not just a lining or coating!

HAVEG equipment lasts longer . . . costs less. Its strength, toughness, and durability make it ideal for tanks, towers, coolers, piping, valves and similar applications. For *real* help in your fight against costly corrosion, investigate HAVEG, now.

Bulletin F-5 gives complete design, engineering and application data. Write for it today.

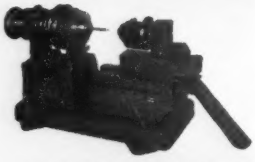
HA-5-48

HAVEG CORPORATION
NEWARK 47, DELAWARE

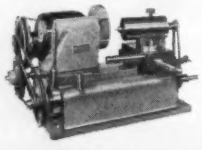
CHICAGO 11 CLEVELAND 14 HARTFORD HOUSTON 6 DETROIT 13 LOS ANGELES 13 SEATTLE 9

NEW
ROOS MACHINES for the DIE ROOM

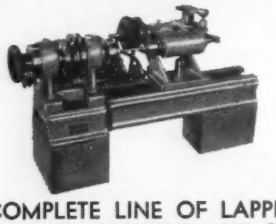
- ROOS PIN MAKER



- ROOS PRECISION PIN GRINDER



- ROOS AUTOMATIC POLISHERS



A COMPLETE LINE OF LAPPING MACHINES, DRILLERS AND POLISHERS TO SPEED UP PRODUCTION IN YOUR

DIE ROOM

WAKE IT UP

with **ROOS**

DIE FINISHING MACHINERY

ROOS TOOL & MFG. COMPANY

Plant and Shipping Point
17 Grove Street, Montclair, N. J.
Sales Office
49 Bloomfield Avenue, Newark 4, N. J.

the 62 vessels which comprise the world's largest inland fleet, and compares with 23,400,000 gross tons moved down last year, which was the former peace-time high mark.

* * *

A Review of Recent Wire Patents

(*Continued from Page* 175)

Laboratories, Incorporated, New York, N. Y., a corporation of New York.

The method comprises mixing finely divided aluminum oxide and water in proportions to form a suspension of creamy consistency, then adding hydrochloric acid to the suspension to increase the fluid content by of the order of 10 per cent, and finally adding finely divided aluminum oxide to the suspension to increase the solid content by of the order of 50 per cent.

* * *

NO. 2,457,705, WIRE CURLING APPARATUS AND METHOD, patented December 28, 1948 by Francis D. Moran, Downers Grove, Ill.

For curling flat wire there is provided a curling curve over which the wire is adapted to be bent, a stationary resilient pressure device for holding the wire bent across the curling curve to bend the same and means for continuously drawing the wire across the curling curve and from between the curling curve and pressure device to continuously impart a bend along the length of the wire and curl the same.

* * *

Reeves Issues New Power Transmission Catalog

A NEW, standard, file-size, 16-page booklet, entitled "Reeves Automatic Production Control," has been released by the **Reeves Pulley Company**, manufacturers of variable speed drives and controls.

* * *

OF particular interest to machine designers, builders and users, the booklet, illustrated with photographs and drawings, discusses the functions of automatic production control and the means of applying it to production machinery through use of their Variable Speed Transmission and Motodrive, in conjunction with their automatic controls.

* * *

DESCRIBED in the booklet are Hydraulic Automatic, Mechanical Automatic and Differential Au-

LET

STANNOCHLOR or STANNOUS SULPHATE solve your tinning problems

One of these two M & T chemicals will meet all your liquor finishing or immersion plating requirements . . . whether for acid or alkaline . . . white or bronze finish baths.

STANNOCHLOR and STANNOUS SULPHATE are stable . . . will not deteriorate with age in summer or in winter. Their use makes it possible to keep a stock on hand at all times . . . permits purchasing in large quantities for economy.

And, because they contain no water of crystallization, STANNOCHLOR and STANNOUS SULPHATE go further pound for pound.

Write for more complete information.

METAL & THERMIT CORPORATION

120 Broadway · New York 5, N.Y.

tomatic Controls, and various speed indicating mechanisms such as the Floating Roll, Follower Roll, Pressure Regulator, Diaphragm Regulator, Float Regulator, Bubble Pipe Regulator and others.

★ ★ ★

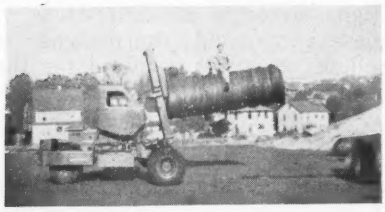
COPIES of the booklet may be obtained by writing to the Reeves Pulley Company, Columbus, Indiana, and asking for Bulletin GN-487.

★ ★ ★

Bulletin Describes New 3-in-1 Truck

A UNIQUE material handling truck, called the Lift-O-Krane, is described in an 8-page bulletin issued by the **Silent Hoist and Crane Company,** 841 63rd St., Brooklyn 20, N. Y.

★ ★ ★



The Lift-O-Krane. * * * * * *

THIS truck combines a high-lift fork truck, a boom crane and a ram truck in one machine, through the use of interchangeable units. The illustration shows it in service in a wire mill, where it averages 5-ton loads of wire. Its versatility enables it to be used for loading and unloading trucks or railroad cars, stocking products in yard or warehouse and as a standby truck for mill maintenance jobs.

★ ★ ★

FOR copies of the bulletin, please address inquiries to the company, asking for Bulletin No. 65W.

★ ★ ★

When you write an ADVERTISER for prices and information, PLEASE MENTION the fact that you saw his ad in WIRE AND WIRE PRODUCTS. It identifies your inquiry and expedites service.

HOWSAM SPOOL COMPANY

500 RATHBONE AVE AURORA ILLINOIS

Phone 2-3043

Wire for Modern Production

● Many manufacturing economies are possible with wire specially shaped for particular needs. Whatever your uses or fabricating methods are, there may be a Continental Manufacturers' wire to meet your exact requirements. Continental wire is made in many shapes, sizes and finishes.

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES - KOKOMO, INDIANA

PRODUCERS OF Manufacturer's Wire in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Lacquer Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.

REELS SPOOLS

ALL SIZES

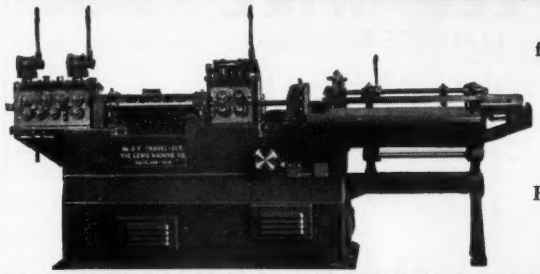
WOOD- PLYWOOD -WOOD-METAL

RETURNABLE NON-RETURNABLE

Samples and Prices on Request

DURKEE MFG. CO. PINE RIVER, MINN.

LEWIS TRAVELCUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to 3/4" rod Round Square Flat Hexagon Ferrous and Non-Ferrous

Automatic High Speed Heavy Duty

LEWIS

The LEWIS MACHINE Co., 3445 E. 76 St., Cleveland, O.

SPECIALIZED WIRE
for WIRE FABRICATORS

Whatever your wire fabrication problem, there is a Cortland Brand specialized low carbon wire to help you make a better product with fewer production stops and rejects. Made with best corrosion-resisting steel from Wickwire's own mills —

All Finishes: Plain, galvanized, coppered or tinned.
All Sizes: Coils, spools, or straightened cut to length.
All Types: Stone wire, bookbinder, flat wire, etc.

Cortland BRAND
WICKWIRE BROTHERS, INC. CORTLAND, N. Y.

Solve
Reduce
WIRE DRAWING PROBLEMS
PRODUCTION COSTS

YOUR INQUIRY WILL BRING YOU FULL INFORMATION ON SOAPS AND COMPOUNDS TO SOLVE YOUR WIRE DRAWING PROBLEMS

R.H.MILLER CO., INC.
HOMER, NEW YORK
ESTABLISHED 1909

WE BUY WE SELL

We Pay Highest Prices for Used Machinery

FOR SALE

2 ENTWISTLE REWIND STANDS
Complete with automatic predetermined length counter, spark box and controls.

TAPING HEADS - all types
WARDWELL BRAIDERS
TAKE-UP STANDS - all sizes

All Machines Reconditioned in Our Own Shop

WIRE & TEXTILE MACHINERY INC.
P. O. BOX 436, PAWTUCKET, R. I.

STEEL WIRE
by MAURICE BONZEL
Translated and Published by
KENNETH B. LEWIS
Consulting Engineer
Price $15.00 — 495 pages — 414 illustrations
Send Orders to
WIRE and WIRE PRODUCTS
300 Main Street Stamford, Conn.

Glass Yarn Improves Performance of Nonmetallic-Sheathed Building Cable

(*Continued from Page* 162)

cable and to improve resistance to the effects of moisture, fire, chemical fumes, and corrosive vapors. Glass yarn is an ideal complimentary material for films, and the combination of films and glass yarn produces a cable jacket which is extremely resistant to abrasion. The glass yarn provides a fibrous reinforcement which is dimensionally stable over a wide range of temperature and humidity conditions. The glass-yarn-reinforced film is resistant to penetration by corrosive vapors and moisture. The use of flame resistant resins in combination with glass produces a jacket which is flame resistant. In addition, the high strength and high coverage characteristics of glass yarn enable the designer to reduce the space required for the jacket reinforcing material.

* * *

IN many cases, glass cords are now being used as the filler material in both conventional and new design cables to provide another component of permanent nature. The same is true of other fibrous components such as binder yarn on the individual conductors.

* * *

Merchant Wire Products

(*Continued from Page* 149)

used for any purpose for which a wire hoop is wanted.

* * *

Stone Wire

STONE wire is an ordinary grade of annealed or soft galvanized wire for common uses such as stovepipe wire, haystack wire, tying wire, and for general home and farm utility purposes. As put up, it usually consists of one to three pieces in 12 pound coils of 8 inch diameter.

* * *

Conclusions

THE few wire products that have been briefly described,

Warner

BELL-MINE

LIME

for

WIRE DRAWING

WARNER COMPANY

BELLEFONTE DIVISION

BELLEFONTE, PA.

Sales Office

Philadelphia—Pittsburgh—New York

EASTWOOD WIRE

CENTRIFUGALLY-CAST FOR QUALITY

Phosphor Bronze

Nickel Silver

WIRE

FLAT

WIRE

ROD

Eastwood-Nealley

CORPORATION

Belleville 9, New Jersey

while important from a tonnage standpoint, are but a few of the thousands of commodities made from wire. The great number of sizes, shapes and finishes of wire, and its multiplicity of uses naturally brought about in the industry a confusion in standards, specifications, tolerances, and even in the meaning of terms used to describe wire. The American Iron and Steel Institute, through its Technical Committee on Carbon Steel Wire, has done much to bring order out of this confusion by compiling Steel Products Manual 16, Carbon Steel Wire. This Manual was first issued in 1939 and has since been revised four times. In this Manual, as far as possible, the products of the wire industry are classified, and terms defined; the manufacturing tolerances that are considered standard in the industry are presented, and specifications for various wire commodities are classified according to standard practices in the industry. This voluntary standardization, simplification, and elimination of excess varieties have brought about substantial benefits to the consumers and distributors as well as to the manufacturers.

★ ★ ★

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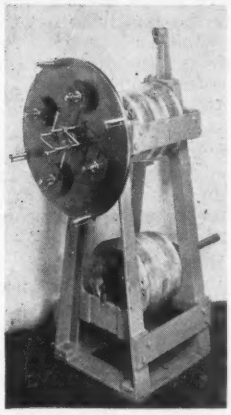
Simplified Practice Recommendation R 9-47, U. S. Department of Commerce.

QUADRUPLE TAPING ECCENTRIC MOUNTED TAPING UNIT NO. 958



ECCENTRIC AND CONCENTRIC TAPING UNITS AND COMPLETE TAPING MACHINES

Send for bulletin Form 81

EST 1853 AIMco INC. 1913

"American" INSULATING MACHINERY COMPANY

517 West Huntingdon St. Zone 33
Philadelphia, Pa.

SPOOLS... REELS... BOBBINS

● IF IT CAN be wound on a reel, spool or bobbin, Apco Mossberg can fill your needs.

For over 50 years we have specialized in the manufacture of spools and reels of all kinds. Our plant is equipped to manufacture almost any conceivable kind, type and size of steel spool, reel and bobbin, in large quantities or small.

Write for our brochure containing useful information on a wide variety of our spool and reel products.

APCO MOSSBERG CO.

Attleboro, Mass., U.S.A.

Hugh Williams & Co., 47 Colborne St.
Toronto, Ontario, Canada

Pacific Coast Representative,
Jack P. Williams, Jr., Matson Building,
215 Market St., San Francisco 5, Calif.

BORAX

More shops are turning to this most satisfactory coating material. It is easy and safe to handle. Does not create dust nuisance.

Pins of wire which have been properly washed after the acid dip, sul coated and then coated with Borax have been satisfactorily drawn after remaining in storage for several weeks.

Borax coated wire used with proper lubricant will increase die life.

Demonstrate the effectiveness of Borax with a fair trial in your own shop as others have done.

Bulletin Submitted on Request

PACIFIC COAST BORAX COMPANY

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★ ★ ★

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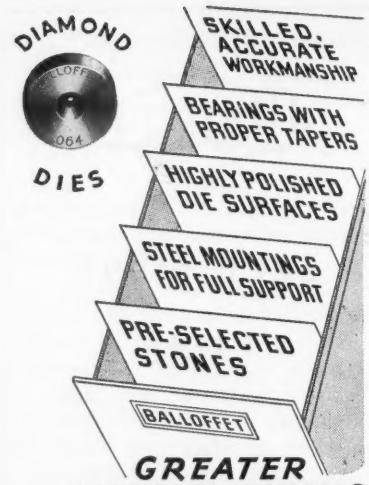

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★ ★ ★

New Dispensing Container by Magnus.

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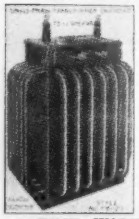

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FOR further information write to Dept. W, Magnus Chemical Co., Inc., Garwood, New Jersey.

★ ★ ★

Labor Relations

(*Continued from Page 163*)

tional capital at the turn of the vear, it becomes evident, that these programs, though they may appear visionary to management, can safely be expected as part of future bargaining negotiations. From present indications it appears the AFL formula of voluntary agreement will be tried first. If that fails, all labor might well unite behind a demand for Congressional action limiting profits and spreading work in time of low employment.

★ ★ ★

Youngstown Sheet & Tube Company Appointment

JOHN D. ANDERSON has been appointed assistant superintendent of the rod, wire and conduit departments at the Struthers, Ohio, plant of the **Youngstown Sheet & Tube Co.**, Youngstown. Mr. Anderson joined the company in 1926 as an inspector in the galvanized sheet department.

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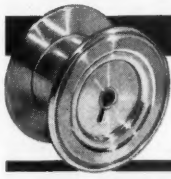
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FOREIGN NOTES

THE extreme difficulties of Germany's steel and wire industry are expressed by the following figures:

★ ★ ★

ONE workman produces actually 28.5 tons of steel annually, as compared with 102 in 1939. The decline of man/hour output in the coke production is 53%; in the pig iron (blast furnace) production 62%. In the wire rod production 58%, wire nail 64% and wire screen industry 70%. The reasons for this decline are:

★ ★ ★

(a) Lack of transportation facilities (f.e. narrow-gauge railway cars). A factory such as the biggest German wire works, the Rheinische Westfaehlische Drahtunion has only 520 cars as compared with 1.380 in 1938, and from these 520, 50% are in constant repair. Lack of trucks and other transportation means.

(b) Only 30% of all workmen in July, 1948 were between the ages of 17 and 37, and 20% were more than 53. In 1939, however, 58% of all men were between 17 and 37 and only 6.8% elder than 53. The absence of millions of prisoners of war (some in Russia and some in France), and the very heavy losses of men killed in the war are another reason; as young workmen hesitate to accept jobs in steel, wire mills, etc., due to discrepancy between heavy work and food.

(c) The shoes and clothing workmen are wearing are nothing better than rags. Many workmen (in some works up to 40%) are wearing shoes rounded by wire, 81% are without mackintosh or umbrellas, and 83% of all workmen own only one pair of shoes and one suit.

(d) The food situation continues unsatisfactory. Although more food is appearing, the workmen are unable to buy it, since the money reform food prices jumped by 91% but wages remain unaltered.

(e) Absenteeism was between 11 and 14% this summer, due to illness and necessity of obtaining food by extra work outside.

(f) 28% of man/hour time is lost due to repairs, as compared with 3.2% in 1939. The obsolete and deficient equipment tends toward a further increase of repairs necessary. Breakdowns are so frequent that production is oscillating wildly. A steel works produced 27.000 tons of steel monthly average this first half of 1948, with 9,700 tons minimum and 36,000 tons maximum in one month.

(g) Due to war damages and demolitions, (in the British and French zone demolishing of works continues) the lack of certain machinery parts, etc., very often leads to the shut-down of works for an indefinite period.

(h) 0.13% of all hands in steel works in 1939 were women; the present figure being 5.8%.

★ ★ ★

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Besides being profusely illustrated, there are many reference tables providing much useful data. An effort has been made to treat every phase of the subject in a practical and helpful manner. If you are making diamond dies or tools, or using them, you cannot afford to be without this book.

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300 Main Street Stamford, Conn.

RECENTLY, optimistic reports have been published that Germany will soon regain her 5.8 Million ton goal established at Potsdam and thereafter proceed to the 11 Million tons of the Marshall Plan but this is regarded in the Ruhr as "fiction." Production of steel developed this year as follows: January 309,517; February 304,480; March 343,325; April 362,753; May 324,545; June 309,176; July 329,337 tons.

TO produce one ton of wire rods in Germany at present, the costs are exactly 103% higher than in the U. S. A., and one ton of wire nails 118%. These are the latest figures for July. Under such circumstances it is quite impossible to compete on the world market. To get the German steel, wire and other industries going, it would be necessary to invest a fantastic sum, and due to complete lack of heavy machinery (production forbidden), all of the machinery must be imported.

★ ★ ★

IT is considered as absolutely out of the question in the Ruhr that the German steel industry can recover her production program next year to an extent of more than 40% of what is foretold by the Marshall Plan for Germany. The wire industry is only 35%. In many works, the machinery has been taken off the cemented floor for demolishing purposes, but has been left standing, rusting and rotting. For example, in the Hamm works 478 wire drawing, wire nail, etc., machines were shut down in 1946, and have been standing there exposed to the weather ever since, and, nobody knowing what to do with them, they are slowly being reduced to scrap.

★ ★ ★

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BORAX—Wire Drawing
Pacific Coast Borax Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Pawtucket, R. I.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

CABLE LACQUERING OVENS—
Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N.J.

CEMENTS—Acid Proof
Sauereisen Cements Co., Pittsburgh, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.
Sauereisen Cements Co., Pittsburgh, Pa.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corporation, Brooklyn, N. Y.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

CLEANERS—Metal and Hand
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Metal & Thermit Corp., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH TESTERS—
Scott Testers, Inc., Providence, R. I.

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Spencer Steel Division, Colorado Fuel & Iron Corp., Buffalo, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J. Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

COLD HEADERS—
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Diamond
Engis Equipment Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CORROSION PREVENTIVES
Angier Corp., The, Framingham, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Champion Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Champion Diamond Co., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Carbide Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND TOOLS—
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Cold Heading
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Carbide Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Lead Extrusion
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
L & H Die Co., Royal Oak, Mich.
Metal Carbides Corporation, Youngstown, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
L & H Die Co., Royal Oak, Mich.
Metal Carbides Corp., Youngstown, O.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
L & H Die Co., Royal Oak, Mich.

WHERE TO BUY, Continued

Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Sintered Carbide
Hoosier Carbide Die Co., Ft. Wayne, Ind.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tubing
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
L & H Die Co., Royal Oak, Mich.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Modern Plastic Machinery Corp., Lodi, N. J.
Rockwell, W. S. Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N. Y.

ENGINEERS—Consulting Spring Design
Carlson, Co., The, New York, N.Y.

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Rockwell, W. S., Co., Fairfield, Conn.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co. Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

HOOKS—Pickling and Liming
Gordon, Clark E., Detroit, Mich.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Martin, Glenn L., Company, Baltimore, Md.
Owens Corning Fiberglas Corp., Toledo, O.
Twitchell, E. W., Philadelphia, Pa.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co. Waterbury, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

LUMBER—Wire Mill, carload lots for lagging and car blocking.
North Anson Reel Co., North Anson, Maine

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co,, The, Bridgeport, Conn.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Coil Winding
Boyd, Charles P., Corp., Philadelphia, Pa.
Rockwell, W. S., Co., Fairfield, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Coilers
Boyd, Charles P., Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Copper Wire Drawing and Rolling
American Insulating Mach'y Co., Phila., Pa.
National Machinery Exchange (used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool, Inc., New Haven, Conn.
National Mach'y Exch. (Used) New York, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Roos, Tool & Mfg. Co., Montclair, N. J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Modern Plastic Machinery Co., Lodi, N. J.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Modern Plastic Machinery Co., Lodi, N. J.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R.I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Black Industries, Cleveland, Ohio.
Eastern Nail Co., Providence, R. I.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I

MACHINERY—Pickling
Gordon, Clark E., Detroit, Mich.
Youngstown Welding & Engineering Company, Youngstown, Ohio.

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
Royle, John & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila, Pa.
Black Industries, Cleveland, Ohio.
Eastern Nail Co., Providence, R. I.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd, Charles P. Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Modern Plastic Machinery Co., Lodi, N. J.
National Mach'y Exch. (Used), New York, N.Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch, H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Physical
Eberbach & Son Co., Ann Arbor, Mich.
Scott Testers, Inc., Providence, R. I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Industrial Ovens, Inc., Cleveland, Ohio.
Modern Plastic Machinery Co., Lodi, N. J.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co. Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N.Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N.Y.

MACHINERY—Wrapping Wire Coils
Angier Corporation, Framingham, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MATERIAL—Resistance Heating Strand
Trauwood Engineering Co., Cleveland, Ohio.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
U. S. Steel Export Co., New York, N. Y.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corp., The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING—Hooks, etc. Acid Resisting
Gordon, Clark E., Detroit, Mich.

PICKLING TANK LININGS—
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS
Entwistle, James L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STANDS—
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS & SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Chicago, Ill.
North Anson Reel Co., North Anson, Maine

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
North Anson Reel Co., North Anson, Maine

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
North Anson Reel Co., North Anson, Maine

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing, Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N.Y.

RODS—Nickel Alloy
Eastwood Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

RODS—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.

RODS—Wire—Non-Ferrous
Eastwood Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WHERE TO BUY, Continued

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel, Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc., Pawtucket, R. I.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Atlas Mineral Products Co. of Pa., Mertztown, Pa.
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.
Rockwell, W. S., Co., Fairfield, Conn.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
Rockwell, W. S., Co., Fairfield, Conn.
National Annealing Box Co., Washington, Pa.

TINSEL—Cords, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Electric Conductor
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Electric Resistance
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Lame, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Thread, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TINSEL—Thread, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co,, The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, New York

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ruesch, H. J., Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—For Insulation
General Electric Co., Schenectady, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
American Brass Co., The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Co., Inc., New York, New York
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago & New York
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div. of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland-Chicago, New York
Columbia Steel Co., San Francisco, Calif.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE—Nickel & Nickel Alloy
Eastwood-Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

WIRE—Nickel Silver and Phosphor Bronze
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., New York, New York.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
American Steel & Wire Co., Cleveland-Chicago
Armco Steel Corp., The, Middletown, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U.S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Co., Cleveland-Chicago, New York
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting—
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Angier Corporation, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Delaware
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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ESTABLISHED 1845

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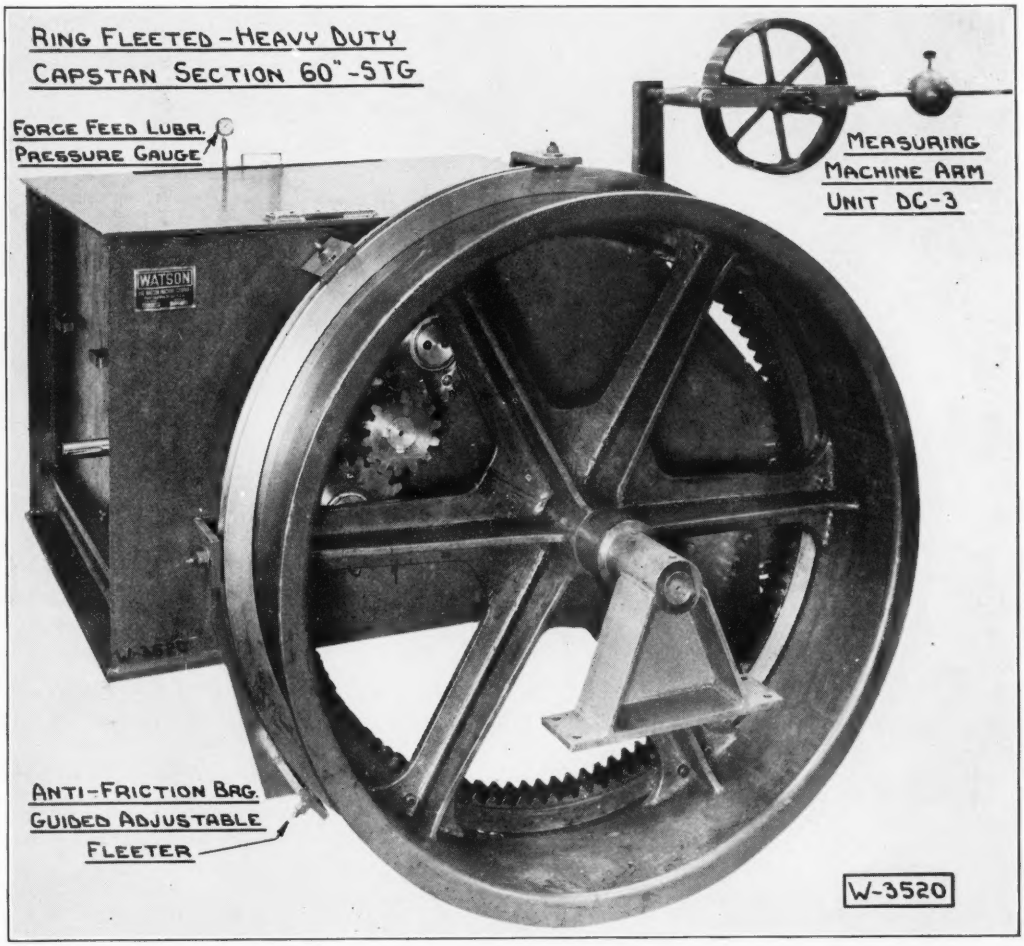
ELECTRICAL WIRE AND CABLE, WIRE ROPE AND CORDAGE MACHINERY

Single Tapered Wheel CAPSTAN SECTIONS—Type "ST"

Unit shown here (No. W-3520) has double pinion drive of extremely heavy haul pull capacity. It is equipped with a full floating ring fleeter and pre-spiraling die drive. Its application is of particular advantage where the cable construction does not favor the repeated "bend-unbend" cycles of double grooved capstan sections.

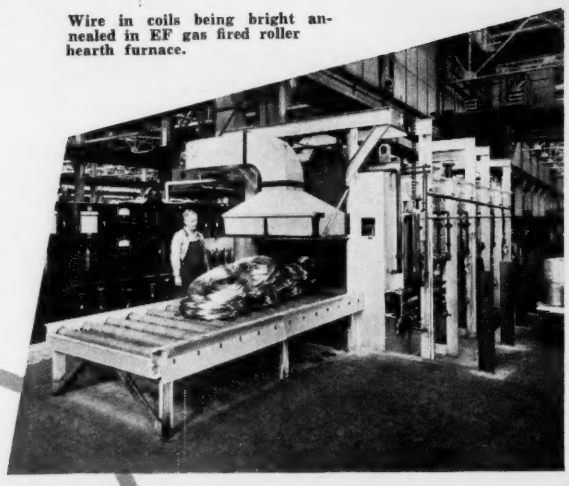


Gear driven sections of 11:1 overall range and Reeves driven sections of 10:1 variation range are available in seven sizes (20" to 118" Dia. Wheels) and wheels alone are carried in stock and can be supplied without delay.

Request Machinery Bulletin 020339

Wire on reels being bright annealed uniformly and continuously in EF gas fired radiant tube bulkhead tray type furnace.

Wire in coils being bright annealed in EF gas fired roller hearth furnace.



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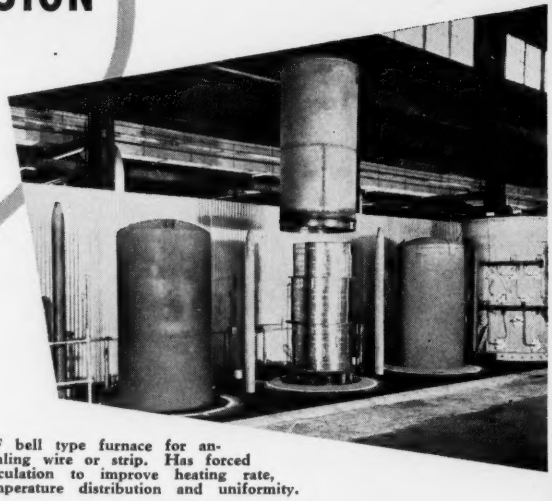
assures users a maximum of long, highly efficient trouble free operation



EF bell type furnace for annealing wire or strip. Has forced circulation to improve heating rate, temperature distribution and uniformity.

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EF engineers conceived and developed the first automatic and continuous heat treating, quench and drawing equipment, that revolutionized all previous furnace practices. They pioneered and perfected the use of endothermic, exothermic and other special atmosphere treatments, which greatly advanced the metallurgical processing of metals, resulting in closer physical tolerances, and permitting the successful use of brazing for joining assemblies of metal parts.

EF developed the first continuous furnace—using low cost atmospheres—for bright annealing steel and non-ferrous strip and wire; and many other devices which are still available only in EF design.

These include the EF radiant tube with heat exchanger which assures extremely high combustion efficiency; the EF cast alloy electric heating elements; EF roller design and mounting that minimizes servicing and maintenance, and other facilities that assure uniform temperatures throughout the furnace, accurate control of heat input within the required limits, reduced maintenance, high hourly outputs, and uniform, low cost, dependable operation.

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